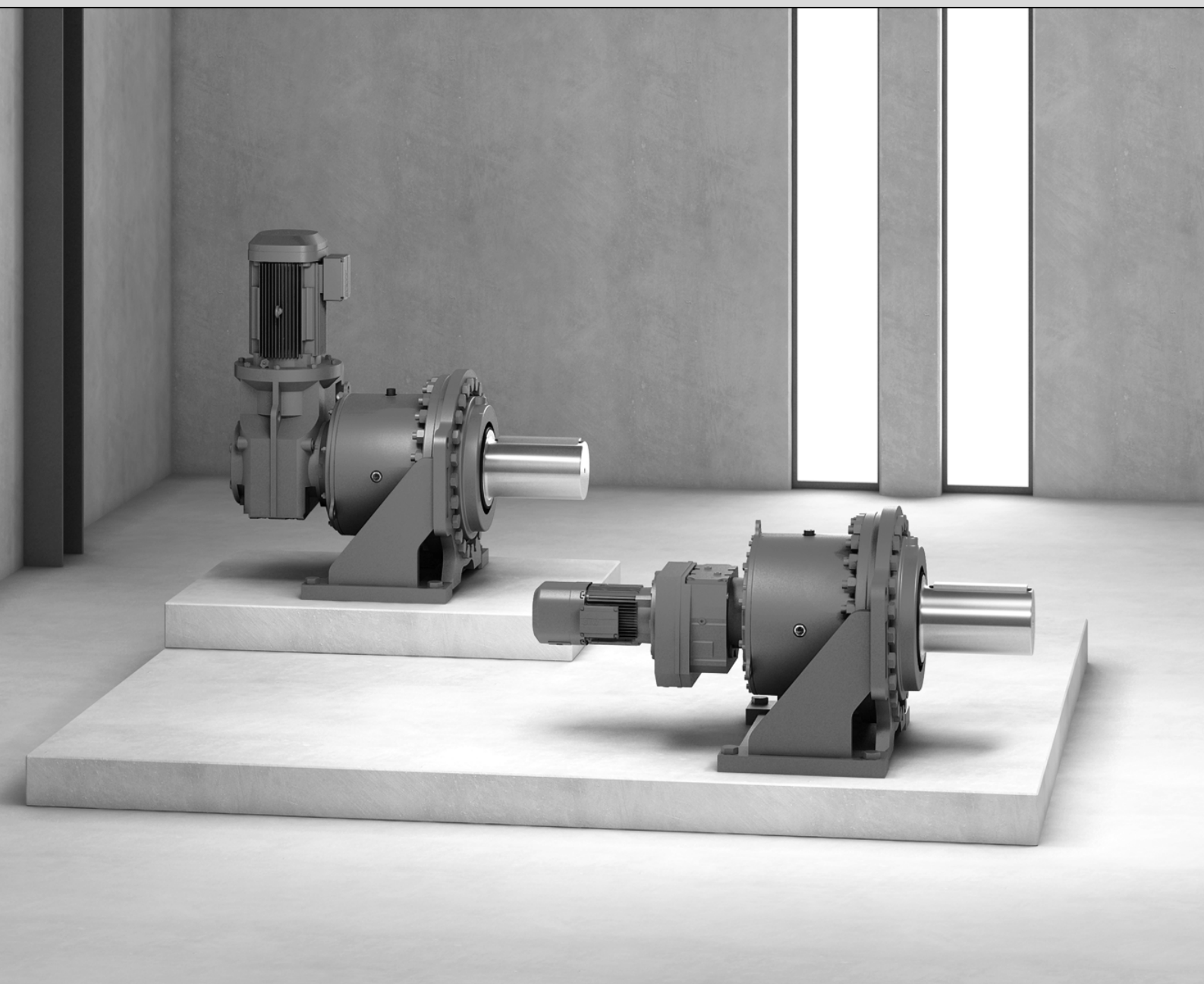




SEW
EURODRIVE



**Industrial Gear Units:
P002 – P082 Series
Planetary Gear Units**

Edition 10/2008

16649613 / EN

Operating Instructions





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1 Important Notes

1.1 How to use the operating instructions

The operating instructions are an integral part of the product and contain important information for operation and service. The operating instructions are written for all employees who assemble, install, startup, and service this product.

The operating instructions must be accessible and legible. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. Consult SEW-EURODRIVE if you have any questions or if you require further information.

1.2 Structure of the safety notes

The safety notes in these operating instructions are structured as follows:

Symbol	 SIGNAL WORD
	Nature and source of hazard. Possible consequence(s) if disregarded. • Measure(s) to prevent the hazard.

Symbol	Signal word	Description	Consequences if disregarded
Example:  General danger	 DANGER	Imminent danger	Severe or fatal injuries
 Specific danger, e.g. electric shock	 WARNING	Possible hazardous situation	Severe or fatal injuries
	 CAUTION	Possible hazardous situation	Minor injuries
	NOTICE	Potential damage to property.	Damage to the drive system or its environment
	TIP	Useful information or tip. Simplifies handling of the drive system.	



1.3 *Rights to claim under warranty*

Adhering to the operating instructions is a prerequisite for fault-free operation and the fulfillment of any right to claim under warranty. Therefore, read the operating instructions before you start working with the unit.

1.4 *Exclusion of liability*

You must comply with the information contained in these operating instructions to ensure safe operation of the P002 – P082 series planetary gear units and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE does not assume liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

1.5 *Copyright*

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Copyright law prohibits the duplication, modification, distribution, and use of any part of this document for ulterior purposes.



2 Safety Notes

2.1 Preliminary remark

The following safety notes are primarily concerned with the use of gear units. If using gearmotors, also refer to the safety notes for motors in the corresponding operating instructions.

Also observe the supplementary safety notes in the individual sections of these operating instructions.

2.2 General information

	DANGER
	During operation, the gear units can have movable or rotating parts as well as hot surfaces. Severe or fatal injuries. • All work related to transportation, putting into storage, setup/mounting, connection, startup, maintenance and repair may only be carried out by qualified personnel observing – The relevant detailed operating instructions – Warning and safety signs on the gear unit – All other project planning documents, operating instructions and wiring diagrams related to the drive – The specific regulations and requirements for the system – The national/regional regulations governing safety and the prevention of accidents • Never install damaged products • Immediately report any damage to the shipping company • Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to property. Refer to the documentation for additional information.

2.3 Designated use

The designated use refers to the procedure specified in the operating instructions.

P002 – P082 series planetary gear units are gear units driven by motors for industrial and commercial systems. Gear unit utilizations other than those specified and areas of application other than industrial and commercial systems can only be used after consultation with SEW-EURODRIVE.

For the purpose of EC Machinery Directive 2006/42/EC, the planetary gear units are components for installation in machinery and systems. In the scope of the EG directive, you must not take the machinery into operation in the designated fashion until you have established that the end product complies with the Machinery Directive 2006/42/EC.



2.4 *Applicable documents*

The following publications and documents have to be observed as well:

- When using gearmotors, also observe the safety notes for motors and primary gear units in the accompanying operating instructions.
- Operating instructions of any attached options

2.5 *Target group*

All mechanical work must be carried out by trained staff only. Qualified personnel in this context are persons who are familiar with the setup, mechanical installation, trouble shooting and maintenance for this product. Further, they are qualified as follows:

- Training in mechanical engineering, e.g. as a mechanic or mechatronics technician (final examinations must have been passed).
- They are familiar with these operating instructions.

All electrical engineering work may be carried out by only a qualified electrician. Qualified electricians in this context are persons who are familiar with the electronic installation, startup, trouble shooting and maintenance for this product. Further, they are qualified as follows:

- Training in electrical engineering, e.g. as an electrician or mechatronics technician (final examinations must have been passed).
- They are familiar with these operating instructions.

All work in further areas of transportation, storage, operation and waste disposal may be carried out only by persons who are trained appropriately.

2.6 *Disposal*

- Housing parts, gears, shafts and roller bearings of the gear units must be disposed of as steel scrap. This also applies to gray-cast iron parts if there is no separate collection.
- Collect waste oil and dispose of it according to the regulations in force.



2.7 Safety symbols on the gear unit

The symbols on the gear unit must be observed. They have the following meaning:

Symbol	Meaning
	Oil fill plug
	Oil drain
	Oil level glass
	Oil dipstick
	Inspection opening
	Breather plug
	Flat grease nipple
	Taper grease nipple
	Air outlet screw
	Water inflow
	Water return
	Direction of rotation
	Delivery state
	Hot surface
 GEAR UNIT IS VPI ANTI-RUST TREATED. COVER AND PLUG OF GEAR UNIT MUST NOT TO BE OPENED AND GEAR UNIT MUST NOT ROTATED BEFORE START-UP. BEFORE START-UP THE PROTECTIVE PLUG MUST BE REMOVED AND REPLACED BY ENCLOSED AIR VALVE.	Extended storage



2.8 Transport

2.8.1 Notes on transport

	! DANGER Suspended loads can fall. Severe or fatal injuries. • The gear unit must be transported in a manner that prevents injuries to persons. • Secure the danger zone. • Stay away from beneath the gear unit during transport.
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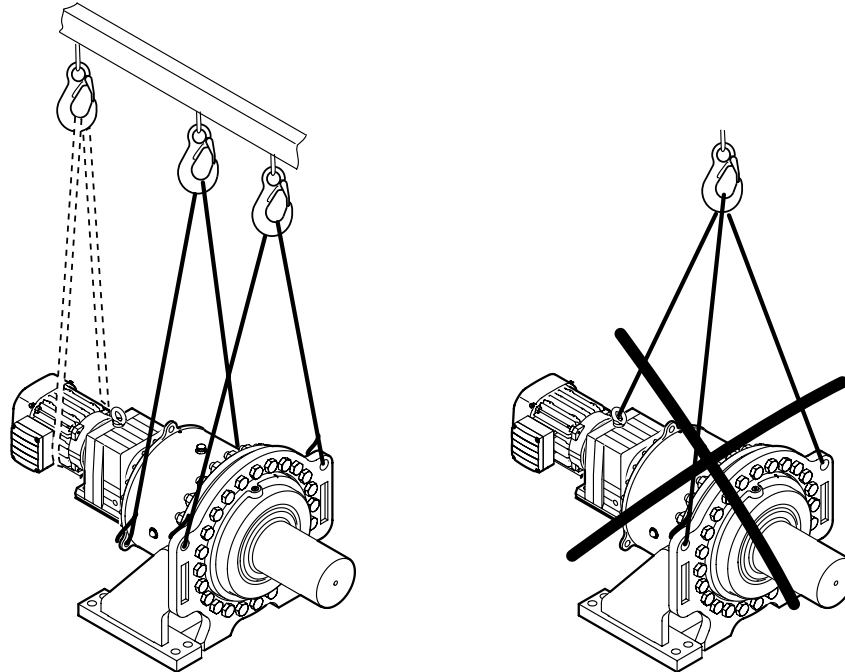
	NOTICE Improper transport may result in damages to the gear unit. Potential damage to property. • Note the following:
--	--

- Immediately upon receipt, inspect the shipment for any damage that may have occurred during transportation. Inform the shipping company immediately in the event of damage. It may be necessary to preclude startup.
- The weight of the gear unit is indicated on the nameplate or the dimension sheet. Observe the loads and specifications given on the nameplate.
- Use suitable, sufficiently rated handling equipment if necessary.
- The gear unit must be transported in a manner that prevents damage to the gear unit. For example, impacts against exposed shaft ends can damage the gear unit.
- Planetary gear units and planetary gearmotors are suspended from the transport points marked in the drawings below. Transport straps (indicated with broken lines in the following figures) help balancing and supporting the planetary gear unit.
- Remove securing devices used for transportation prior to startup.



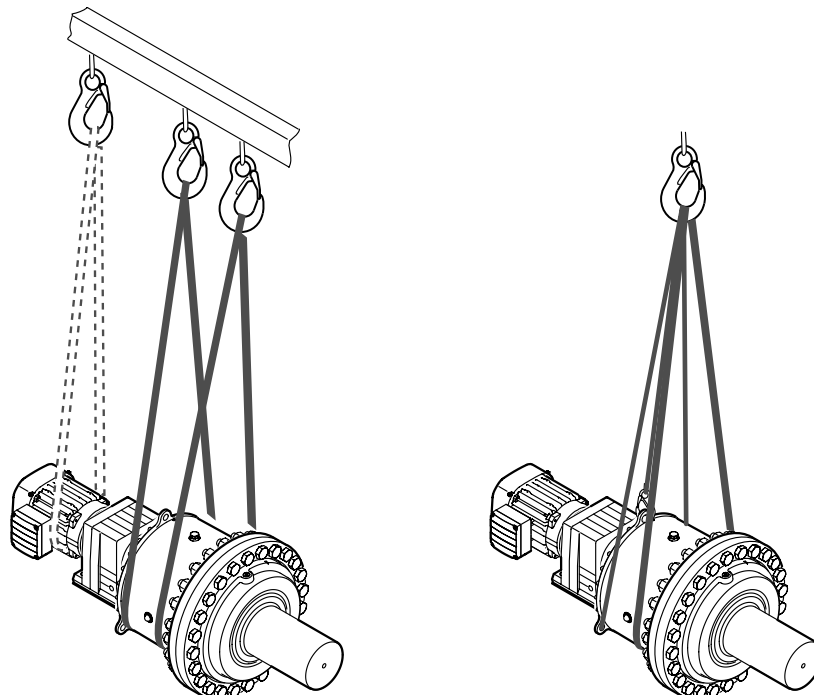
2.8.2 Foot-mounted planetary gear unit

The following figure shows an example of how to transport a foot-mounted planetary gear unit.



2.8.3 Flange-mounted planetary gear unit

The following figure shows an example of how to transport a flange-mounted planetary gear unit.





2.9 Storage and transport conditions

2.9.1 Internal corrosion protection

Standard protection

After the test run, the test oil fill is drained out of the gear unit. The remaining oil film protects the gear unit against corrosion for a limited period of time.

Long-term protection

After the test run, the test oil fill is drained out of the gear unit and the interior space is filled with a vapor phase inhibitor. The breather filter is replaced by a screw plug and enclosed with the gear unit.

2.9.2 Exterior corrosion protection

- Bare, uncoated parts are coated with an anti-rust agent. Remove it only using an appropriate solvent which is not harmful to the oil seal.
- Sealing surfaces on radial oil seals are protected by an appropriate anti-corrosion agent.
- Small spare parts and loose pieces, such as bolts, nuts, etc., are packed in corrosion protection plastic bags (VCI corrosion protection bags).
- Threaded holes are covered by plastic plugs.
- If the gear unit is stored longer than six months, you must check the protective coating of unpainted areas as well as the paint coating regularly. Areas where the protective coating or paint has been damaged have to be repainted, as needed.
- The output shaft must be rotated at least one full rotation so that the position of the roller elements in the bearings of the input and output shafts changes. This procedure must be repeated every six months until startup.

2.9.3 Packaging

Standard package

The gear unit is delivered on a pallet without cover.

Application: Land transport

Long-term packaging

The gear unit is attached to a pallet, wrapped in film and equipped with appropriate corrosion protection material in the film packaging.

Application: Land transport and for long-term storage

Seaworthy packaging

The gear unit is packaged in a seaworthy wooden box and is delivered on a pallet that is appropriate for sea transport. The gear unit is wrapped in a film and equipped with appropriate corrosion protection material in the film packaging.

Application: Sea transport and for long-term storage



2.9.4 Storage conditions

	NOTICE
	Improper storage may result in damages to the gear unit. Potential damage to property. - The gear unit must be stored in a shock-free manner in order to prevent damage to the anti-friction bearing races. - The gear units are delivered without an oil fill; different protection systems are required depending on storage period and storage conditions.

Climate zone	Packaging + corrosion protection	Storage location	Storage duration
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones)	Long-term packaging + Long-term corrosion protection:	With roof, protected against rain and snow, no shock loads.	Up to three years with regular checks of the packaging and moisture indicator (Relative humidity < 50%).
	Standard packaging + Standard corrosion protection	Roofed, enclosed at constant temperature and atmospheric humidity (5 °C < 9 < 60 °C, relative humidity < 50 %). No sudden temperature fluctuations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors and no shock loads.	One year or more with regular inspections. During inspection, check for cleanliness and mechanical damages. Check corrosion protection.
Tropical (Asia, Africa, Central and South America, Australia, New Zealand excluding temperate zones)	Long-term packaging + Long-term corrosion protection: Protected against insect damage and mold through chemical treatment.	Under roof, protected from rain and shocks	Up to three years with regular checks of the packaging and moisture indicator (Relative humidity < 50%).
	Standard packaging + Standard corrosion protection	Roofed, enclosed at constant temperature and atmospheric humidity (5 °C < 9 < 60 °C, relative humidity < 50 %). No sudden temperature fluctuations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors and no shock loads. Protection against insect damage.	One year or more with regular inspections. During inspection, check for cleanliness and mechanical damages. Check corrosion protection.



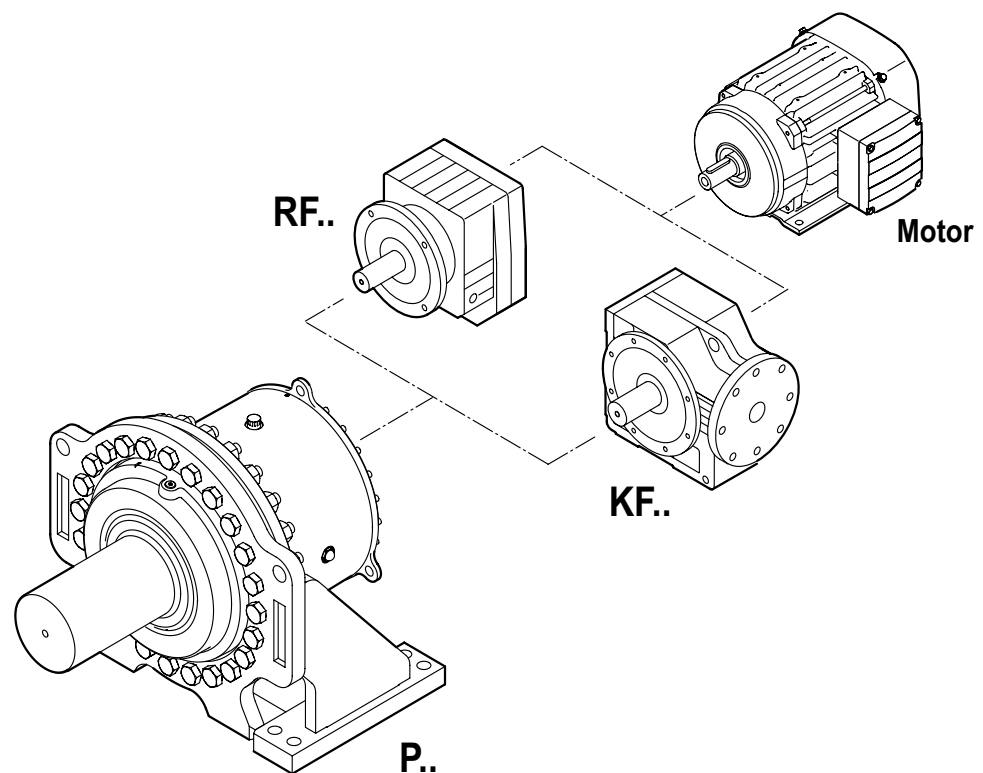
3 Gear Unit Design

3.1 Combination of planetary gear unit with primary gear unit

The planetary gear units are a combination of

1. P.. planetary gear units Output stage
2. Primary gear unit RF.. or KF..
3. Mount-on components: Motor, coupling, adapter and backstop

The following figure shows a sample combination of a planetary gear unit, a primary gear unit and a motor.



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- P..** Planetary gear units
RF.. Helical gear unit (flange-mounted)
KF.. Bevel gear unit (flange-mounted)



3.2 Nameplate and unit designation

3.2.1 Planetary gear units

Sample nameplate

SEW-EURODRIVE		Bruchsal / Germany	
Type	PF042 KF97 DRS132 ML4 / TF		
Nr. 1	01.1101687801.0001.06 / 12345678		
	norm.	min.	max.
PK1 [kW]	6.6	1.3	6.6
MK2 [Nm]	77000	77000	77000
n1 [1/min]	1430	285	1430
n2 [1/min]	0.77	0.15	0.77
Operation instruction have to be observed!			FA2 [N]
Made in Germany			Mass [kg]
Qty of greasing points			Fans
CLP HC VG220 synth. Oil - 29 ltr.			Year

1124395915

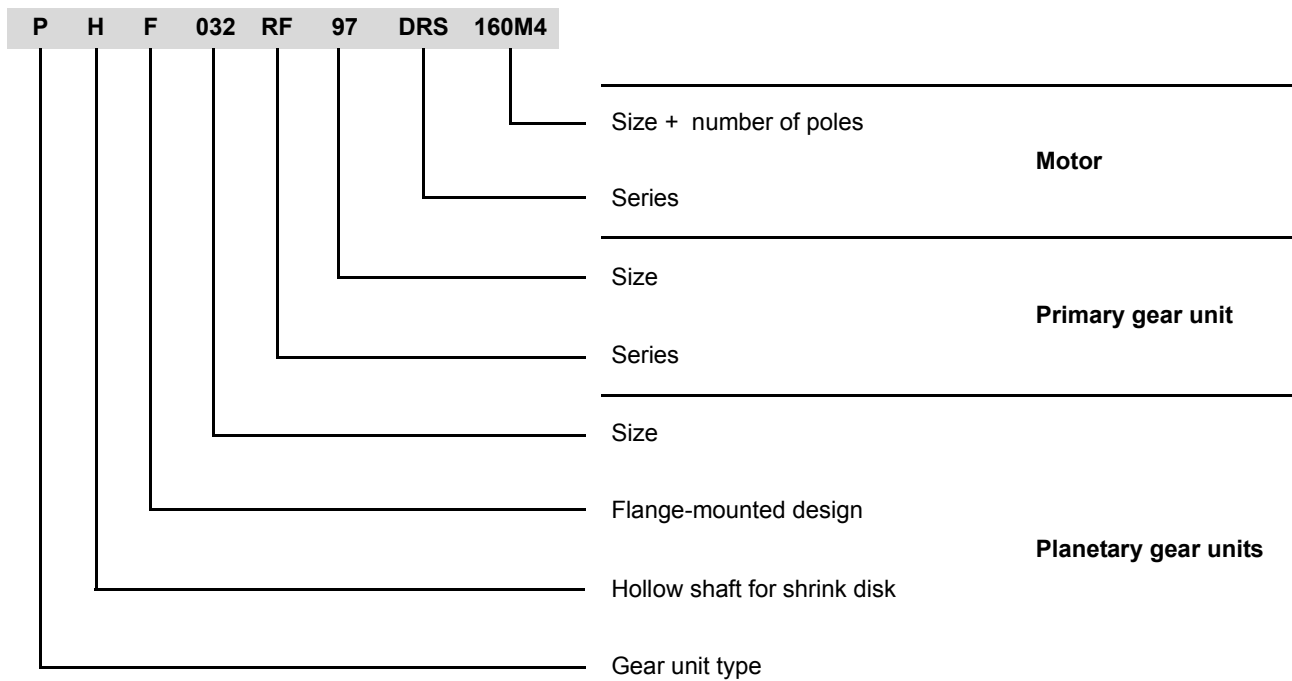
Type		Unit designation
No. 1		Serial number
P_{K1}	[kW]	Operating power on the input shaft (HSS)
M_{K2}	[Nm]	Gear unit output torque
n₁	[1/min]	Input speed (HSS)
n₂	[1/min]	Output speed (LSS)
norm.		Standard operating point
min.		Operating point at minimum speed
max.		Operating point at maximum speed
i		Exact gear unit reduction ratio
F_S		Service factor
F_{R1}	[N]	Actual overhung load acting on the input shaft
F_{R2}	[N]	Actual overhung load acting on the output shaft
F_{A1}	[N]	Actual axial load acting on the input shaft
F_{A2}	[N]	Actual axial load acting on the output shaft
Mass	[kg]	Weight of the gear unit
Number of greasing points		Number of relubrication points
Fans		Number of installed fans
		Oil grade and viscosity class / oil volume
Year		Year of construction
IM		Mounting position and mounting surface



Gear Unit Design

Nameplate and unit designation

Sample unit designation





3.2.2 Primary gear unit

Sample nameplate

SEW-EURODRIVE		Bruchsal/Germany	
Typ	RF 47 /A		
Nr.	01.11124560001.00001.07		
Pe kW	0,55	Ma Nm	90
n r/min	57		
IM	M1	i 1:	23,59
kg	23,4		
Schmierstoff CLP HC 220 Synt. Öl /1,5l			
Made in Germany 181 861 9.14			

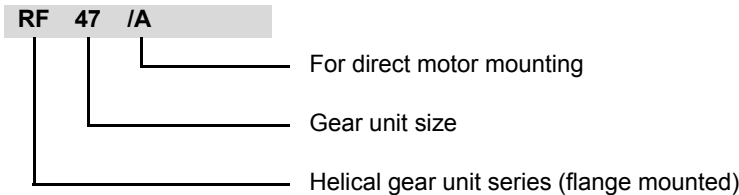
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f_b		= Service factor
F_{Ra max}	[N]	= Maximum overhung load on the output side
F_{Re max}	[N]	= Maximum overhung load on the input side (with input shaft assembly AD)
i		= Gear unit reduction ratio
IM		= Mounting position
IP..		= Enclosure
n_{e max}	[1/min]	= maximum input speed
n_a	[1/min]	= output speed
M_{emax}	[Nm]	= maximum input torque
M_a	[Nm]	= Output torque
M_R	[Nm]	= Overload torque when using an AR adapter
M_{RS}	[Nm]	= Locking torque of the backstop

Unit designation

	TIP
	For a detailed overview of unit designations and additional information, refer to the following publications: • "Gear Units" catalog or • "Gearmotors" catalog

Example: Helical gear units





Gear Unit Design

Nameplate and unit designation

3.2.3 Primary gear unit with motor

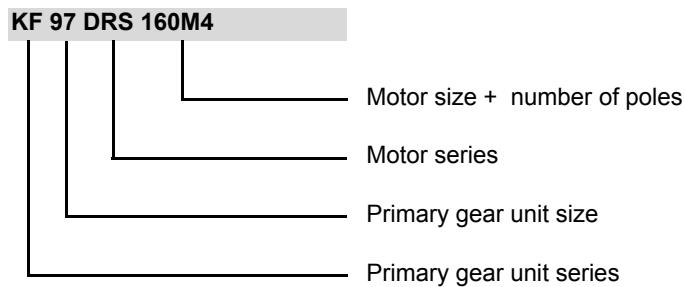
Sample nameplate

SEW-EURODRIVE Bruchsal / Germany	
Typ KF97 DRS160M4	
Nr. 01.3998708401.0001.01 3~IEC60034	
1/min 1460/26	kW 11 S1 i 56.55 Nm 4070
○ V 400/690 Δ/Y	cos φ 0.81 eff% 90.7 ○
V 380-420 Δ/660-725 Y	A 22.5/13.0 Iso.KI. 130 (B)
IM M1	IP 54 Hz 50.0
CLP 220 Miner.Öl / 7.0 l	kg 251.000

1419791115

Type		Unit designation
No.		Serial number of primary gearmotor
i		Transmission ratio
rpm	[min ⁻¹]	Input/output speed
Nm	[Nm]	Output torque
kW	[kW]	Input power of the gear unit
S1		Operating mode
cos φ		Power factor of the motor
V	[V]	Supply voltage for delta/star connection
A	[A]	Rated motor current in delta/star connection
Hz	[Hz]	Line frequency
IM		Mounting position
kg	[kg]	Weight of the primary gearmotor
IP		Degree of protection of the motor
Brake V	[V]	Brake connection voltage
Nm	[Nm]	Braking torque
		Oil grade and viscosity class / oil volume

Sample unit designation



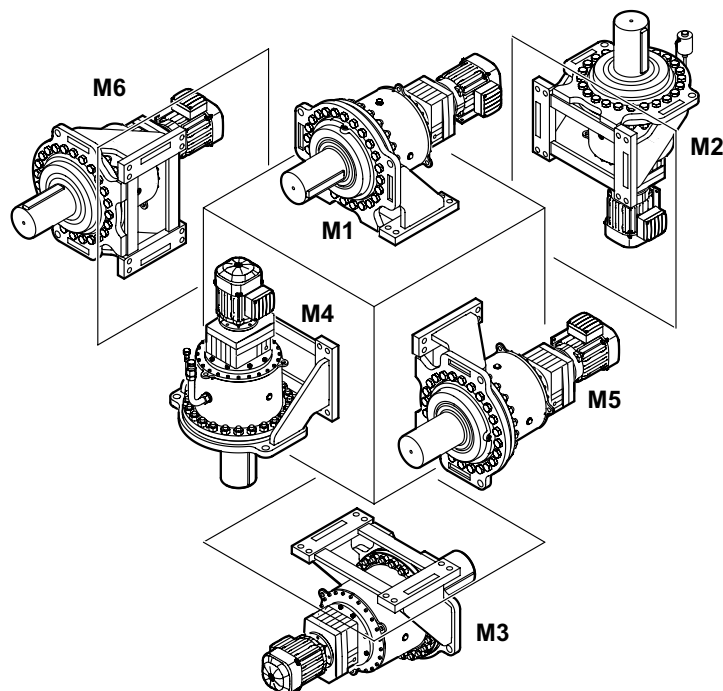


3.3 Mounting position

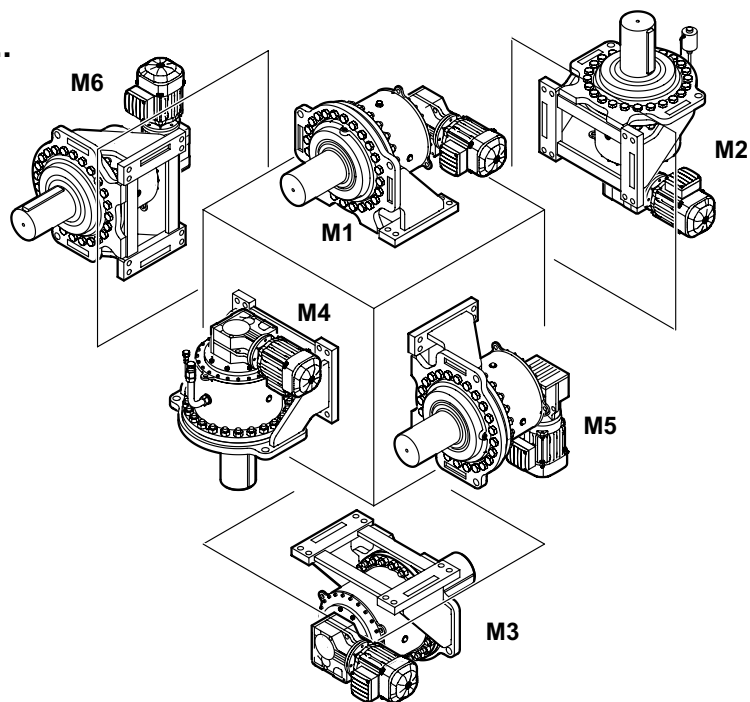
The mounting position defines the spatial orientation of the gear unit housing and is designated **M1..M6**.

The mounting positions apply to planetary gear units with solid shafts and hollow shafts.

P..RF..



P..KF..

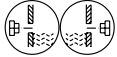


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3.4 Mounting position sheets

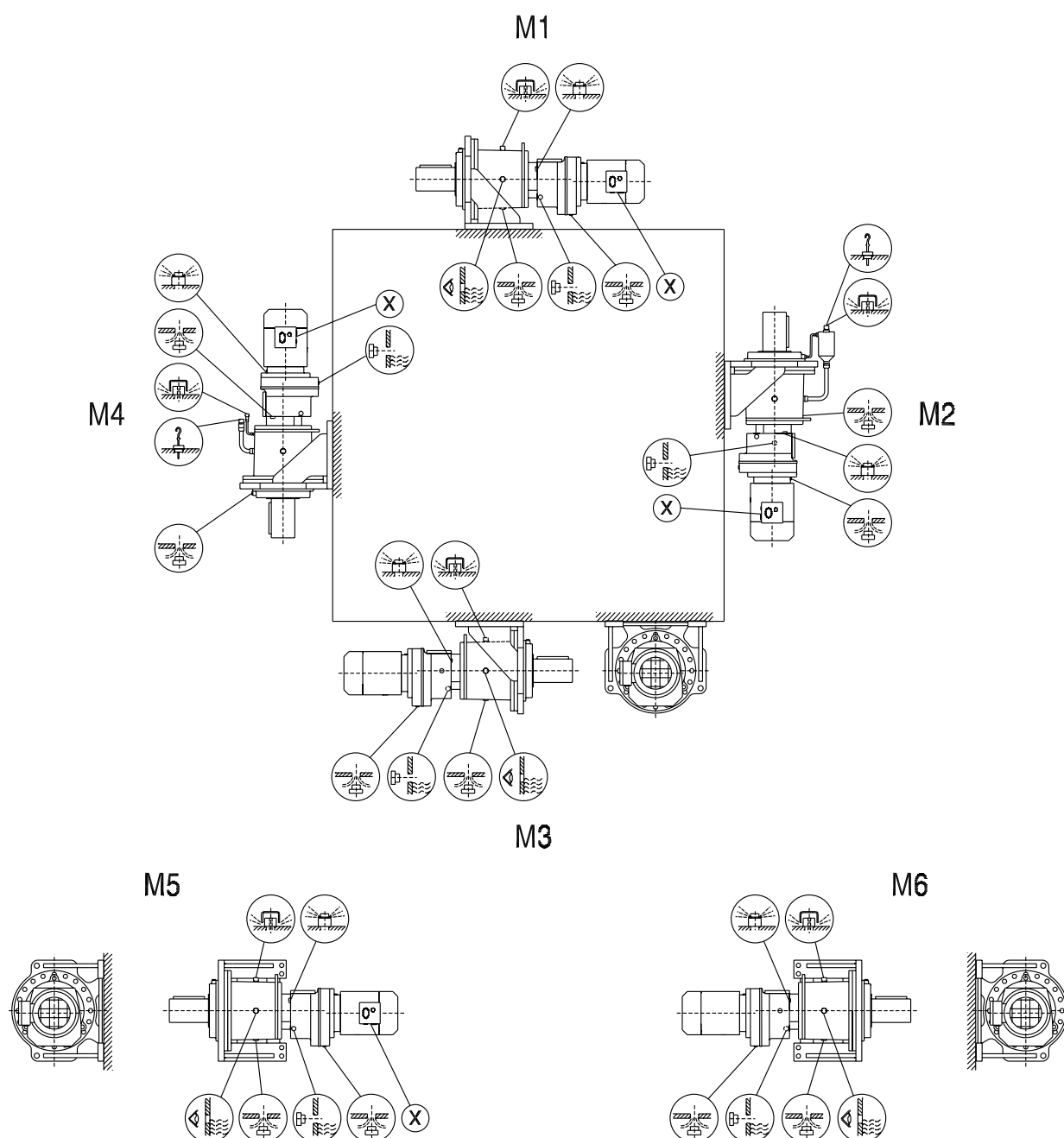
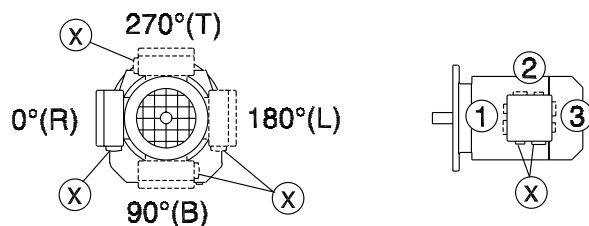
The following table shows the symbols used in the mounting position sheets and what they mean:

Symbol	Description
	Breather valve
	Oil level plug
	Oil drain plug
	Breather
	Oil dipstick
	Oil sight glass



3.4.1 P..RF..

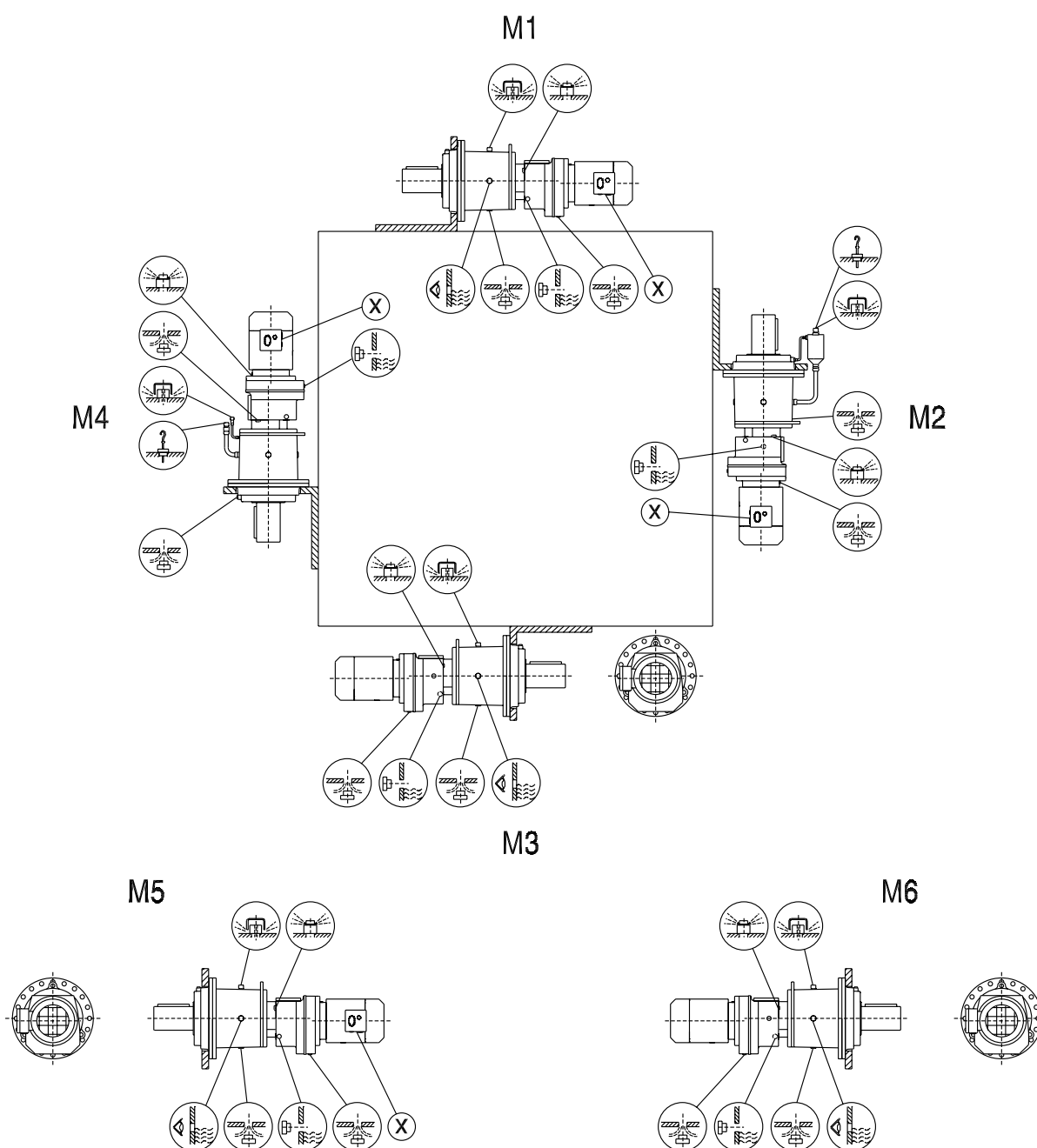
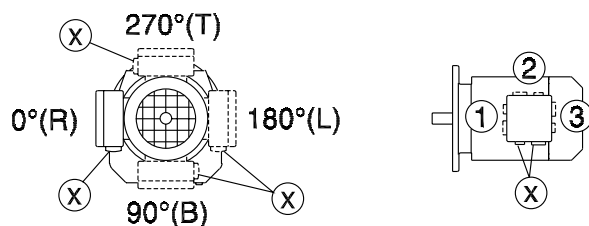
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3.4.2 PF..RF..

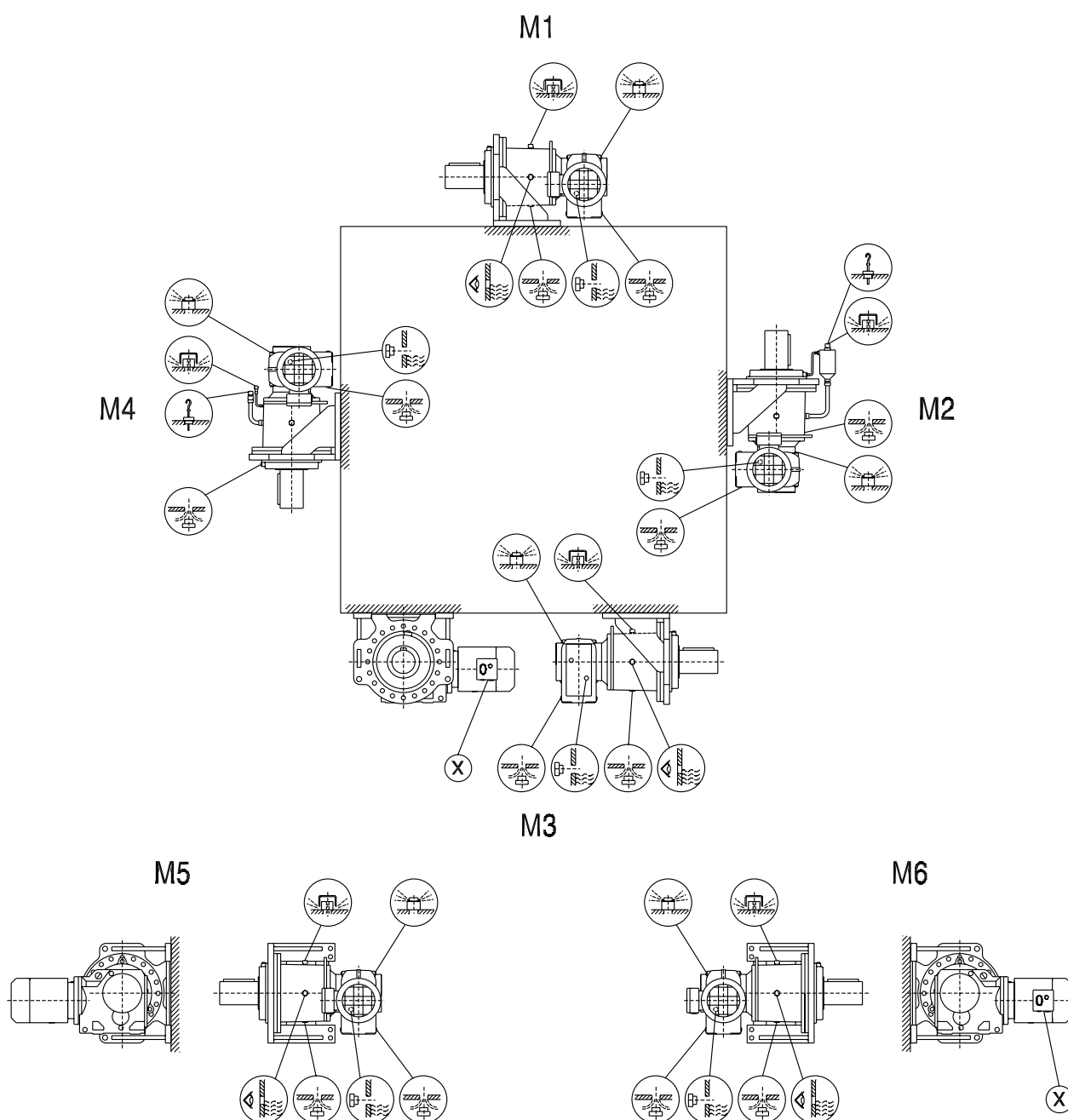
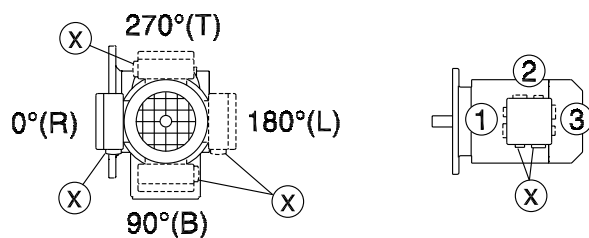
45 130 00 08



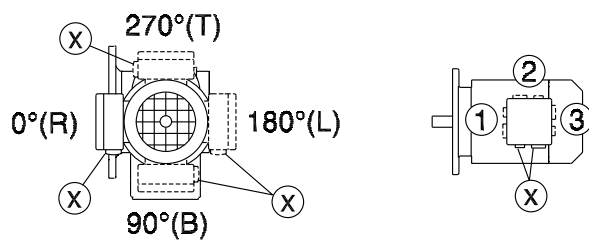


3.4.3 P..KF..

45 131 00 08



45 132 00 08



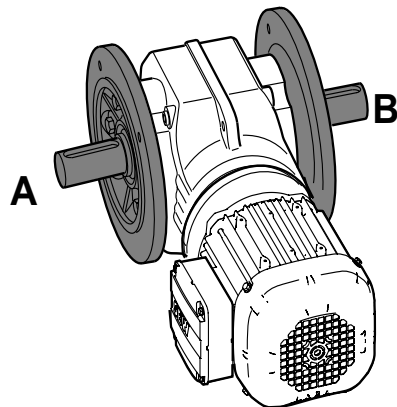


3.5 Mounting positions of the primary gear units

i	TIP
	In addition to the mounting position, the following information is specified for the planetary gear motors.

3.5.1 KF.. primary bevel gear unit

For the primary bevel gear units KF.., positions **0°**, **90°**, **180°** or **270°** are fixed.
The position of the mounting flange on the **A** or **B** side is also defined.



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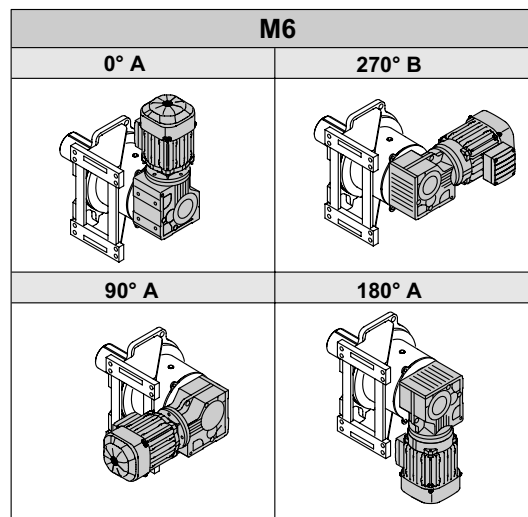
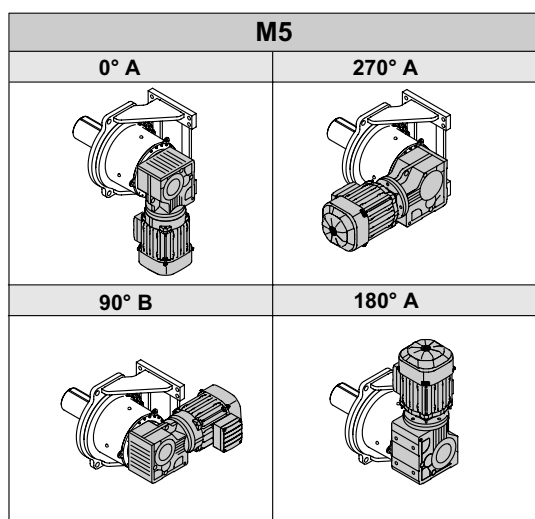
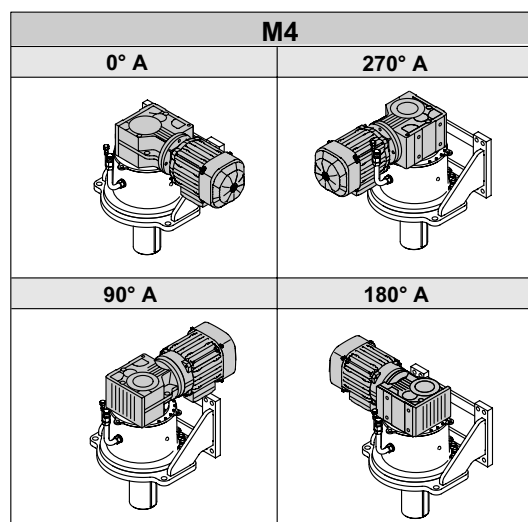
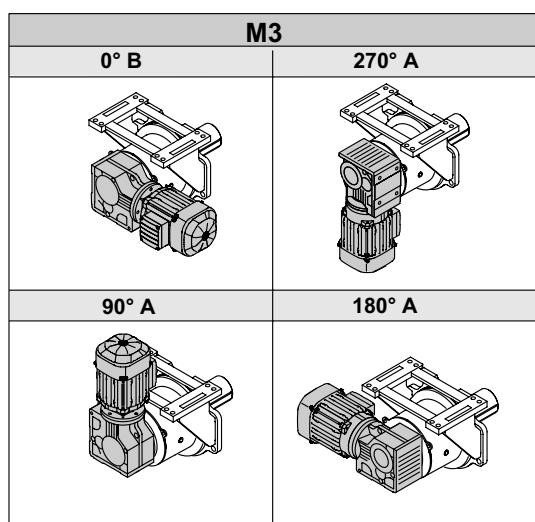
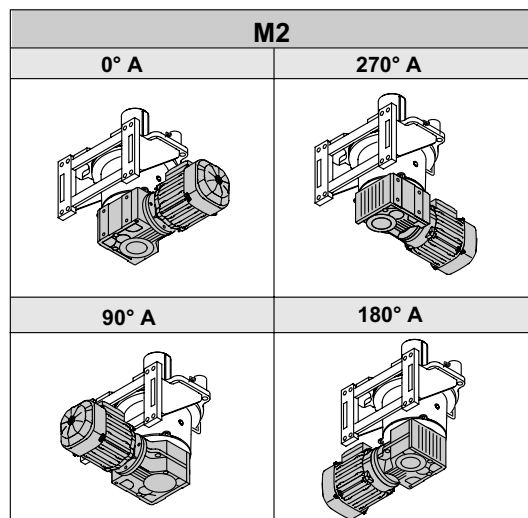
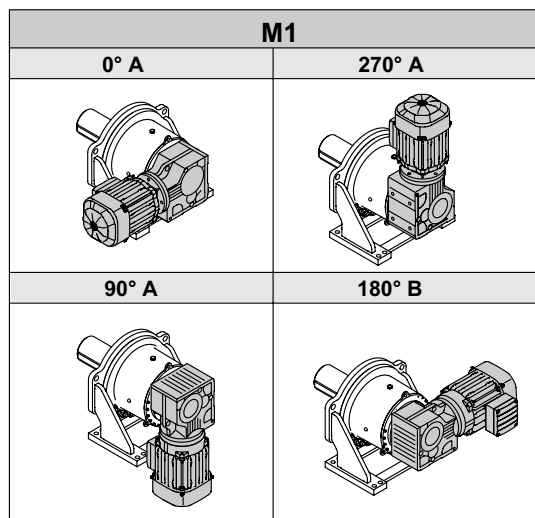
To reduce the churning losses in the primary gear unit to a minimum, SEW-EURODRIVE recommends to choose from the standard mounting positions displayed below.

i	TIP
	Contact SEW-EURODRIVE in case of deviating mounting conditions.



Gear Unit Design

Mounting positions of the primary gear units



1043699211

Key

M1 / M2 / M3 / M4 / M5 / M6	= Mounting position of planetary gear unit
0° / 90° / 180° / 270°	= Mounting position of primary bevel gear unit
A / B	= Position of the mounting flange at the primary bevel gear unit



3.5.2 RF.. primary helical gear unit

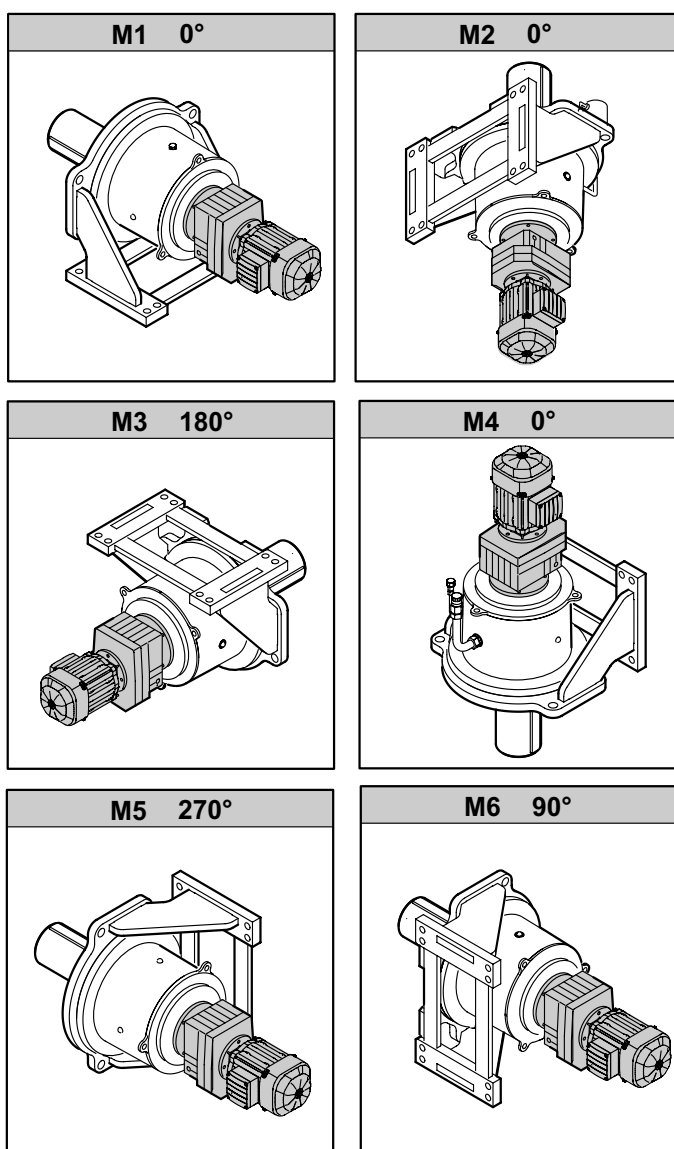
For the primary helical gear units RF.., positions **0°**, **90°**, **180°** or **270°** are fixed.

To reduce the churning losses in the primary gear unit to a minimum, SEW-EURODRIVE recommends to choose from the standard mounting positions displayed below.



TIP

Contact SEW-EURODRIVE in case of deviating mounting positions.



1043719691

Key	
M1 / M2 / M3 / M4 / M5 / M6	= Mounting position of planetary gear unit
0° / 90° / 180° / 270°	= Mounting position of primary helical gear unit



3.6 Pivot mounting position

Pivot mounting positions are mounting positions which differ from the standard mounting positions.

The designation of the pivot mounting positions is set up as follows:

M1 – M4 / 20°

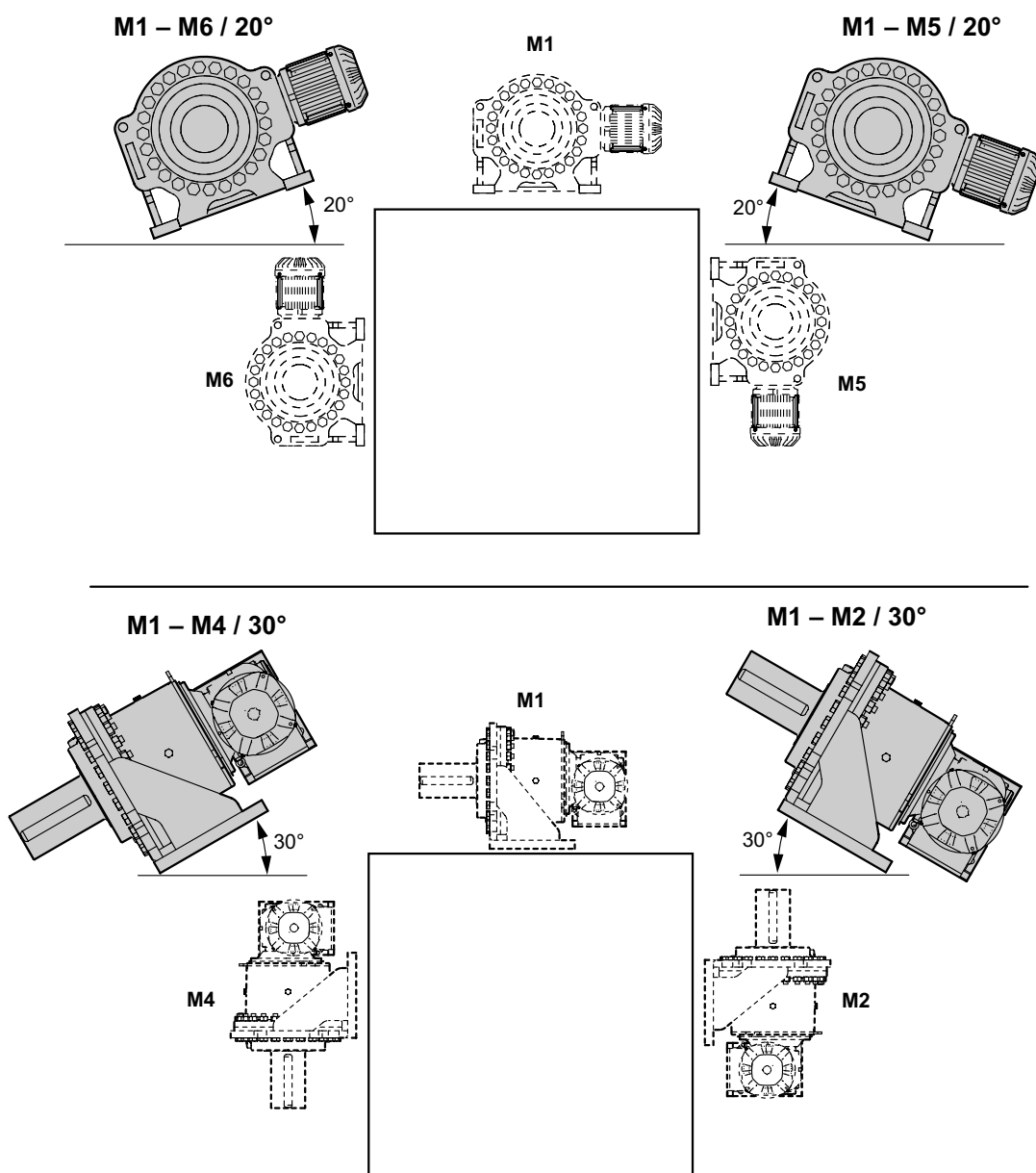
[1] [2] [3]

[1] Starting mounting position

[2] Target mounting position

[3] Pivoting angle

The following figure shows 4 examples:



TIP

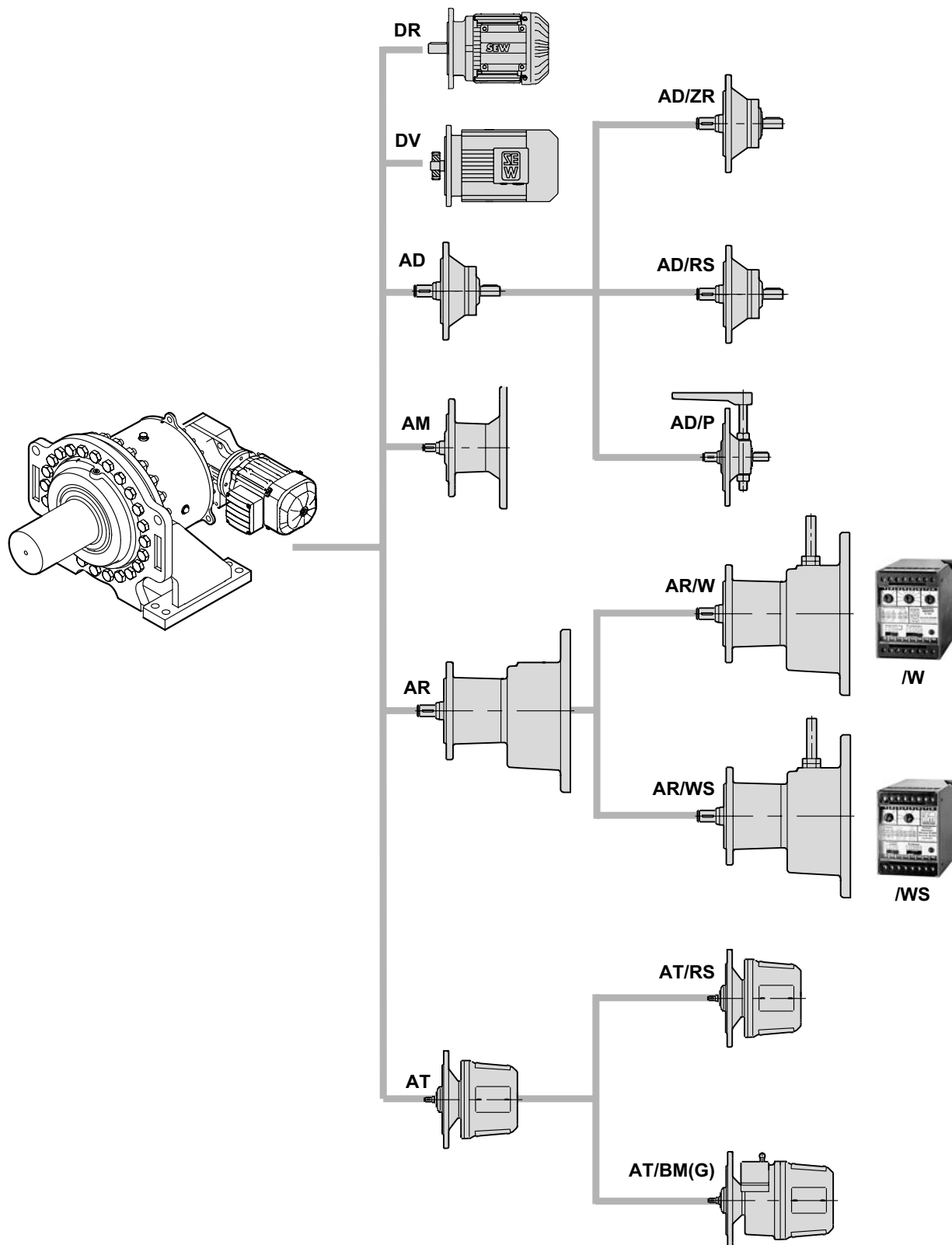
Pivot mounting positions may involve restrictions for accessories and technical data and possibly longer delivery times. Contact SEW-EURODRIVE.



4 Structure of Options and Additional Features

4.1 Input components

The following figure shows an overview of the components on the the input side.





4.2 Torque arm

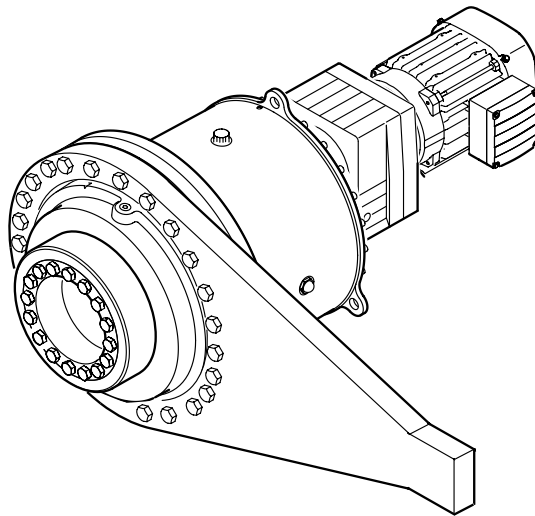
A torque arm is available to support the reaction torque of solid and hollow shaft gear units in the shaft-mounted version.

The torque arm can bear tensile stress as well as thrust loads.

4.2.1 Single-sided torque arm

The torque arm is enclosed in the delivery or can be mounted according to customer requirements. The retaining screws are included in the scope of delivery.

The following figure shows a sample combination of a planetary gearmotor with a torque arm on one side.



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4.3 PT100 temperature sensor

The temperature sensor PT100 can be used to measure the temperature of the oil in the gear unit.

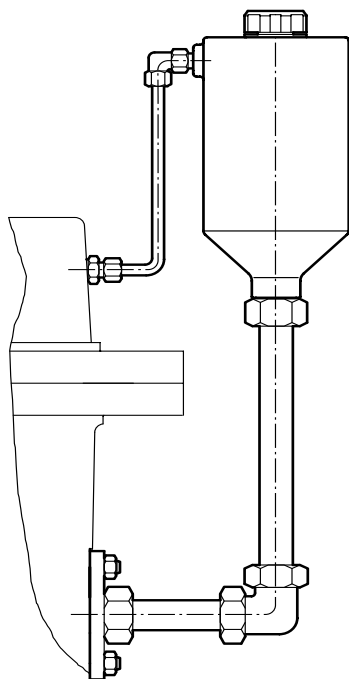
The temperature sensor is located in the gear unit's oil sump. The exact position depends on the gear unit variant.



4.4 Oil expansion tank / oil riser pipe

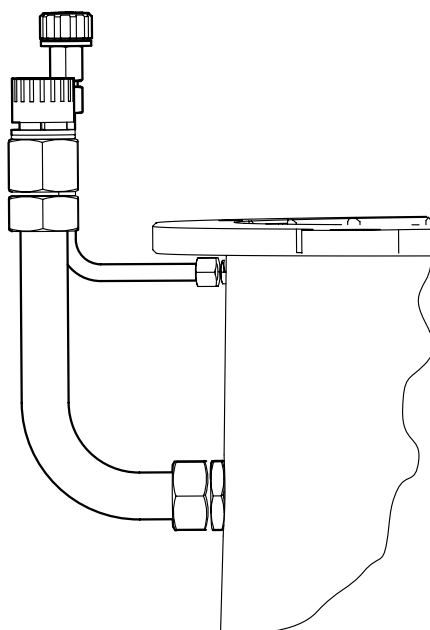
If there is little space available for installing the oil expansion tank (M2 mounting position) or the oil riser pipes (M4 mounting positions), you can request an order-specific dimension drawing from SEW-EURODRIVE.

4.4.1 Oil expansion tank for mounting position M2



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4.4.2 Oil riser pipe for mounting position M4



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5 Installation/Assembly

5.1 Required tools/resources

Not included in the scope of delivery:

- Set of wrenches
- Torque wrench
- Mounting device
- Compensation elements (shims, spacing rings)
- Fasteners for input and output elements
- Lubricant (e.g. NOCO[®] fluid from SEW-EURODRIVE) → except for hollow shaft gear units
- For hollow shaft gear units → aids for assembly/disassembly onto the machine shaft
- Securing components for the gear unit base

5.2 Tolerances

5.2.1 P.. planetary gear units

Shaft ends Diameter tolerance in accordance with DIN 748:
 $\varnothing > 50 \text{ mm} \rightarrow \text{ISO m6}$

Center bores:

- $\varnothing 120 \dots 210 \text{ mm} \rightarrow \text{M20}$
- $\varnothing 240 \dots 290 \text{ mm} \rightarrow \text{M24}$

Mounting flange Centering shoulder tolerance: ISO f8

5.2.2 RF../KF.. primary gear unit

Shaft ends Diameter tolerance in accordance with DIN 748:
 $\varnothing \leq 50 \text{ mm} \rightarrow \text{ISO k6}$
 $\varnothing > 50 \text{ mm} \rightarrow \text{ISO m6}$

Center bores to DIN 332 D:

- $\varnothing > 85 \dots 130 \text{ mm} \rightarrow \text{M24}$
- $\varnothing > 130 \dots 180 \text{ mm}^{1)} \rightarrow \text{M30}$

1) Dimensions not according to DIN 332; the thread depth including the counterbore is at least twice that of the rated thread diameter

Keys according to DIN 6885 (domed type)

Mounting flange Centering shoulder tolerance: ISO f7



5.3 Notes on installation/mounting

	NOTICE
	Improper installation/mounting may result in damages to the gear unit. Potential damage to property. Note the following:

- Strictly observe the safety notes in the individual chapters.
- The planetary gear units are delivered without oil fill.
- RF../KF.. primary gear units have a lubricant fill in accordance with their mounting position.
- The oil chambers of both gear units are separate. Exceptions are specifically identified as such.
- The most important technical data is included on the nameplate. Additional data relevant for operation is available in drawings, order confirmations or any order-specific documentation.
- The mounting position may only be changed after consultation with SEW-EURO-DRIVE. The warranty will become void without prior consultation.
Oil expansion tanks and/or an oil riser pipe are required if you change to a vertical mounting position. Adjust the lubricant fill quantities and the position of the breather valve accordingly.
- Install/mount the gear unit only in the specified mounting position on a level, vibration-damping, and torsionally rigid support structure. Do not twist housing legs and mounting flanges against each other!
- Work on the gear unit only when the machine is not in use. Secure the drive unit against unintentional power-up. Place an information sign near the ON switch to warn that the gear unit is being worked on.
- The plugs for checking and draining oil and the breather valves must be freely accessible.
- Use plastic inserts (2 to 3 mm thick) if there is a risk of electrochemical corrosion between the gear unit and the driven machine (connection between different metals such as cast iron and high-grade steel). Also fit the bolts with plastic washers. Ground the housing additionally and use grounding screws on the motor.
- Only authorized personnel may assemble gear head units with motors and adapters. Contact SEW-EURODRIVE.
- Do not weld anywhere on the drive. Do not use the drive as a ground point for welding work. Welding may destroy gearing parts and bearings.
- Protect rotating drive parts, such as couplings, gears, or belt drives using suitable devices that protect from contact.
- Units installed outdoors must be protected from the sun. Suitable protective devices are required, such as covers or roofs. When using these, avoid heat accumulation. The operator must ensure that foreign objects do not impair the function of the gear unit (e.g., by falling objects or coverings).
- Protect the gear unit from direct cold air currents. Condensation may cause water to accumulate in the oil.
- For the standard mounting positions, the breather valve on planetary gear units is mounted at the factory and activated if the gear unit is supplied without an oil fill.



Check the correct mounting and the function of the breather valve.

- Gear units are supplied with a coating suitable for use in damp areas or in the open air. Repair any damage to the paint work (e.g. on the breather valve).

5.4 Preliminary work

Check that the following conditions have been met:

- The entries on the nameplate of the gearmotor match the voltage supply system.
- The drive has not been damaged during transportation or storage.
- Ambient temperature according to the technical documentation, nameplate and lubricant table in section Lubricants (see page 78).
- No harmful oils, acids, gases, vapors, radiation etc. in the vicinity
- You must clean the output shafts and flange surfaces thoroughly to ensure they are free of anti-corrosion agents, contamination or similar. Use a commercially available solvent. Do not expose the sealing lips of the oil seals to the solvent – damage to the material!

5.4.1 Extended storage

Note: The service life of the lubricant in the bearings is reduced if the unit is stored for ≥ 1 year (only applies to bearings with grease lubrication).

Replace the enclosed breather with the corresponding screw plug.

5.4.2 Oil filling process

Fill the gear unit with the oil grade and oil volume specified on the nameplate.

- The amount depends on the mounting position and the lubrication type.
- Check oil level using the oil level glass or the oil dipstick

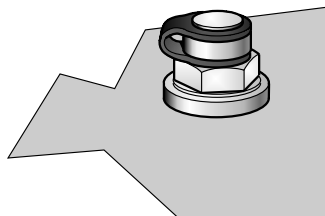


5.5 Installing the gear unit

5.5.1 Breather valve with RF../KF.. primary gear unit

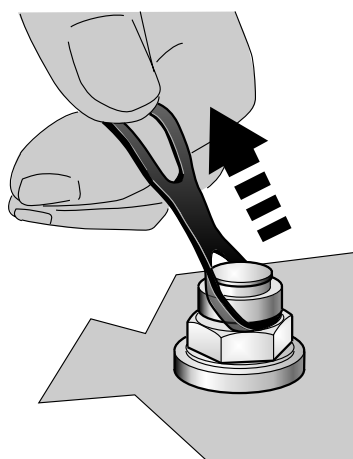
Check whether the breather valve is activated. If the breather valve has not been activated, you must remove the transport fixture from the breather valve before starting up the gear unit!

1. Breather valve with transport fixture



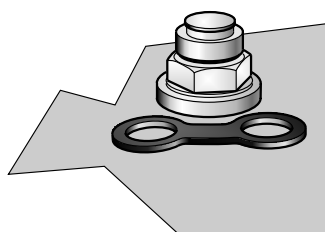
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2. Remove the transport fixture



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3. Activated breather valve



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5.5.2 Foundation

To ensure quick and successful mounting, the type of foundation should be correctly selected and the mounting carefully planned in advance. Foundation drawings with all necessary construction and dimension details should be available.

To avoid harmful vibrations and oscillations, adequate rigidity must be ensured when mounting the gear unit on a steel construction. The foundation must be dimensioned according to weight and torque of the gear unit by taking into account the forces acting on the gear unit.

Tighten retaining screws or nuts to the specified torque. Use the screws and tightening torques specified in section 5.3.



NOTICE

An improper foundation may result in damages to the gear unit.

Potential damage to property.

- The foundation must be level and flat, the gear unit may not be deformed when the retaining screws are tightened.

5.5.3 Aligning the shaft axis



DANGER

Shafts may break if shaft axes are not aligned exactly.

Severe or fatal injuries.

- The separate operating instructions should be consulted regarding the requirements of the couplings.

The service life of the shafts, bearings and couplings essentially depends on the precision of the alignment of the shaft axes with each other.

Always try to achieve zero deviation. When doing so, you should also consult the special operating instructions regarding the requirements of the clutches, for example.

5.5.4 Painting the gear unit



NOTICE

Breather valves and oil seals may be damaged during the painting or re-painting process.

Potential damage to property.

- Thoroughly cover the breather valves and the sealing lip of the oil seals with strips prior to the painting process.
- Remove the strips after the process.



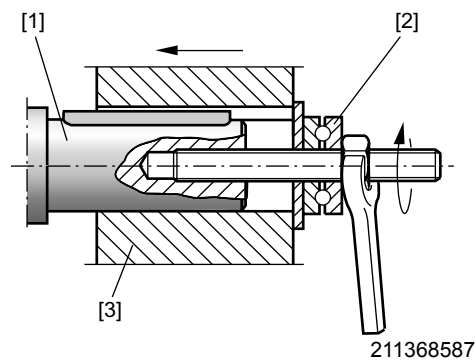
5.6 Gear units with solid shaft

5.6.1 Mounting input and output components

	NOTICE
	Bearing, hosing or shaft may be damaged due to improper assembly. Potential damage to property. • Only use a mounting device for installing input and output elements. Use the center bore and the thread on the shaft end for positioning. • Never force belt pulleys, couplings, pinions, etc. onto the shaft end by hitting them with a hammer. This will damage the bearings, housing and the shaft. • In the case of belt pulleys, make sure the belt is tensioned correctly in accordance with the manufacturer's instructions.

Assembly with mounting device

The following figure shows a mounting device for installing couplings or hubs on gear unit or motor shaft ends. Should you be able to tighten the screw without any problems, you may not need the thrust bearing on the mounting device.



- [1] Gear shaft end
- [2] Thrust bearing
- [3] Coupling hub

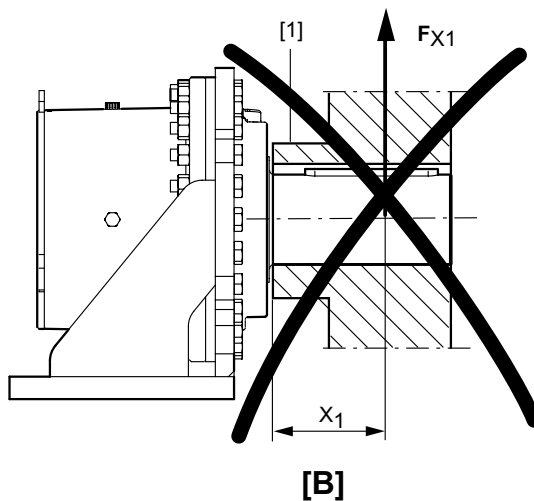
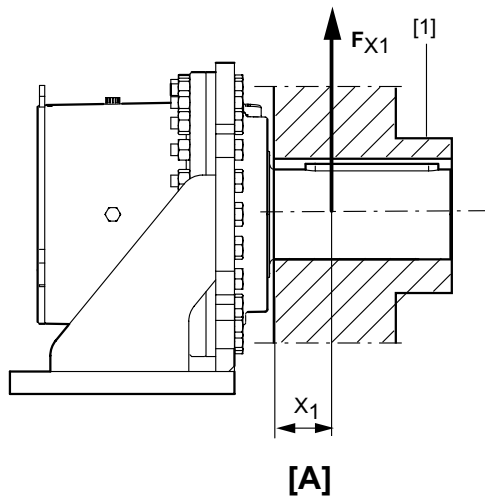


Installation/Assembly

Gear units with solid shaft

Avoid excessive overhung loads

Avoid high overhung loads by: Installing the gear or chain sprocket according to figure **A** if possible.



[1] Hub
[A] unfavorable
[B] correct

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TIP

Mounting is easier if you first apply lubricant to the output element or heat it up briefly (to 80 ... 140 °C).



5.6.2 Coupling mounting



CAUTION!

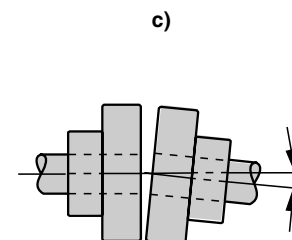
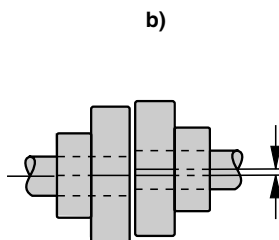
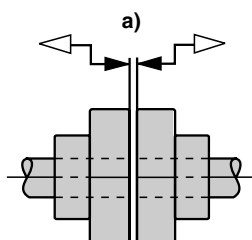
Input and output components such as belt pulleys, couplings etc. are in fast motion during operation.

Risk of jamming and crushing.

- Cover input and output components with a touch guard.

Adjust the following misalignments according to the coupling manufacturer's specifications when mounting couplings.

- a) Maximum and minimum clearance
- b) Axial offset
- c) Angular offset



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5.7 Gear unit mounting for foot-mounted units

The following table shows the thread sizes and the tightening torques of the individual gear unit sizes.

Size	Screw / nut	Number	Tightening torque screw / nut Strength class 8.8 [Nm]
P002	M20	8	410
P012	M20		
P022	M20		
P032	M24		710
P042	M30		1450
P052	M36		2500
P062	M36		
P072	M42		4000
P082	M42		4000



TIP

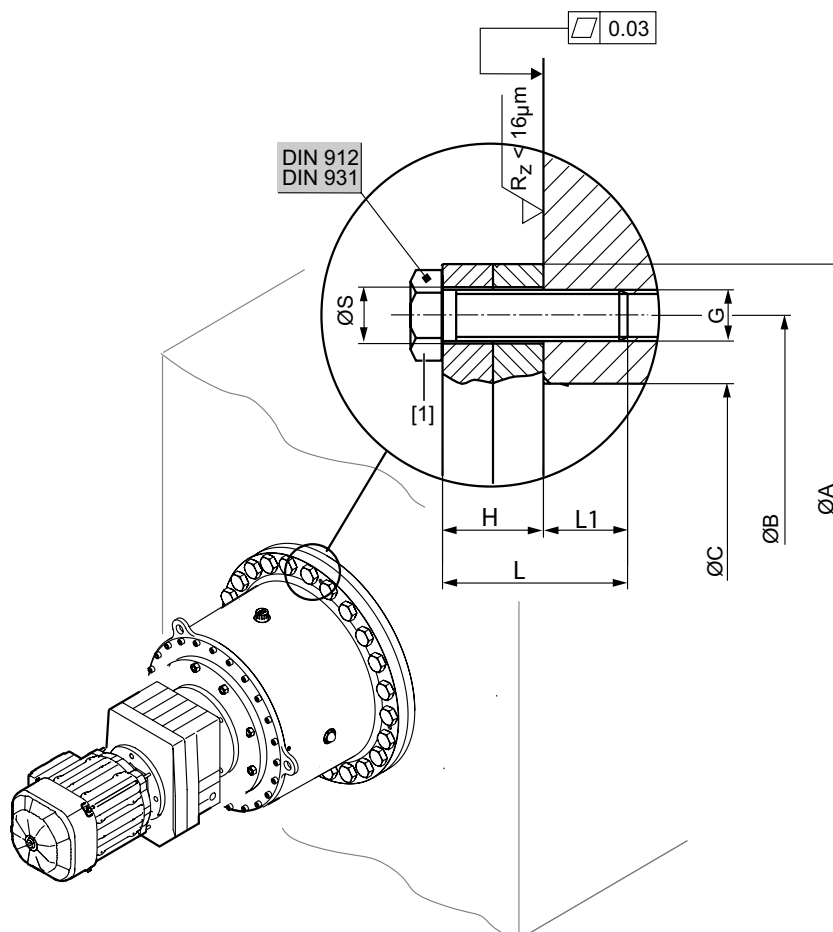
The bolts must not be lubricated during assembly.



5.8 Gear unit mounting for flange-mounted units

When mounting the gear unit to the torque arm and/or machine frame, secure the screws [1] additionally by using Loctite® 640.

The following figure shows an example of how flange-mounted gear units are installed.



Size	Thread	Quantity	Tightening torque [Nm] ± 20 %	Dimensions in [mm]							Strength classes	DIN screws
				Ø S	H	L	L1	Ø A	Ø B	Ø C		
P002	M20	16	579	22	39.5	73.5	34	410	370	330 f8	10.9	DIN EN ISO 4017 DIN EN ISO 4762
P012	M20	20	579	22	41.5	73.5	32	450	410	370 f8		
P022	M20	24	579	22	48	84	36	500	460	410 f8		
P032	M24	20	1000	26	50	84	34	560	510	460 f8		
P042	M30	20	2011	33	64	114	50	620	560	480 f8		
P052	M30	24	2011	33	64	114	50	650	590	530 f8		
P062	M36	24	3492	39	74	134	60	760	690	610 f8		
P072	M36	24	3492	39	84	144	60	840	770	690 f8		
P082	M42	24	3492	45	84	154	70	920	840	750 f8		



5.9 Torque arms for hollow shaft gear units

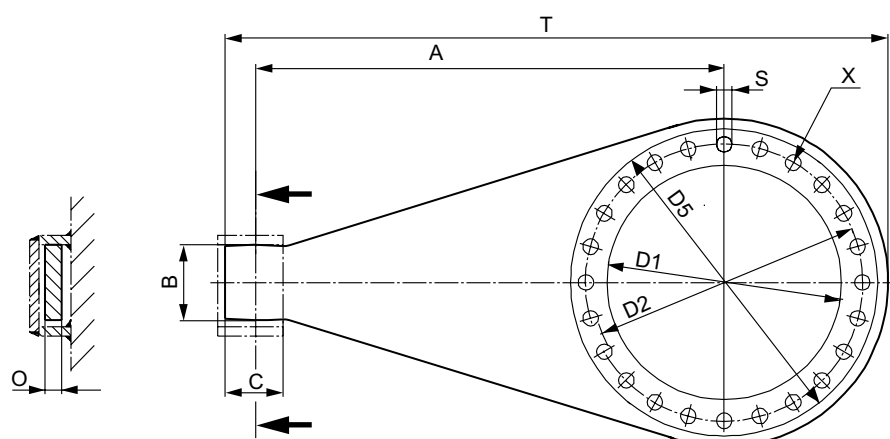
	NOTICE
	Improper assembling may result in damages to the gear unit. Potential damage to property. Do not place torque arms under strain during installation.

5.9.1 Single-sided torque arm (standard)

The reactive force due to the gear unit torque is absorbed via the torque arm with lever arm A. The illustration shows an example for absorption in a welded construction with design dimensions. Two supporting plates are welded with the suggested dimensions on the machine design. Once the gear unit has been mounted, a connecting cover plate is welded onto the two supporting plates. The force of the gear unit torque acts on the support, divided by the length of the lever arm A. The reaction force also acts on the gear unit and machine shafts.

Dimensions

The following figure shows a sample torque arm.



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Size	Dimensions in [mm]								Quantity	Weight [Kg]
	A	B	C	D1	D2	O	S	T		
P002	650	60	50	334	370	25	22	880	16	25
P012	700	70	60	374	410	30	22	955	20	35
P022	750	90	70	414	460	35	22	1035	24	48
P032	800	110	90	464	510	35	26	1125	20	58
P042	900	150	120	484	560	40	33	1270	20	93
P052	1000	160	130	534	590	40	33	1390	24	102
P062	1200	180	150	614	690	50	39	1655	24	183
P072	1500	230	200	694	770	60	39	2020	24	317
P082	1600	230	200	754	840	70	45	2160	24	420


Tightening torques

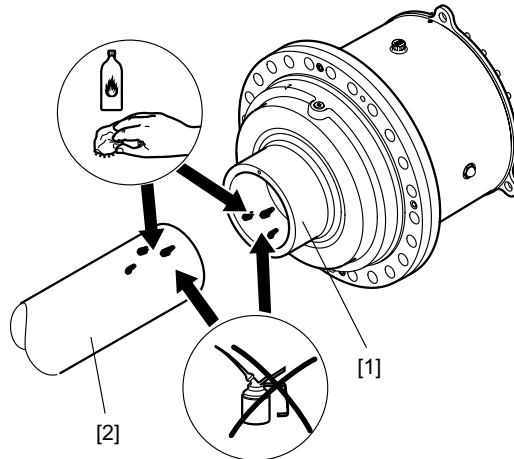
Size	Thread	Quantity	Tightening torque [Nm] ± 20 %	Strength classes	DIN screws
P002	M20	16	579	10.9	DIN EN ISO 4017 DIN EN ISO 4762
P012	M20	20	579		
P022	M20	24	579		
P032	M24	20	1000		
P042	M30	20	2011		
P052	M30	24	2011		
P062	M36	24	3492		
P072	M36	24	3492		
P082	M42	24	3492		



5.10 Hollow shaft and shrink disk

5.10.1 Mounting

1. Before installing the shrink disk, clean and degrease the hub [1] and the machine shaft [2]. This is a very important factor for the reliability of torque transmission.



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2. Ensure that the dimensions of the machine shafts [2] correspond to SEW specifications.
3. Slide the loose shrink disk [3] onto the hub [1].
4. Check the correct position of the shrink disk [3]. The shrink disk is positioned correctly when it is in contact with the shaft shoulder [8].

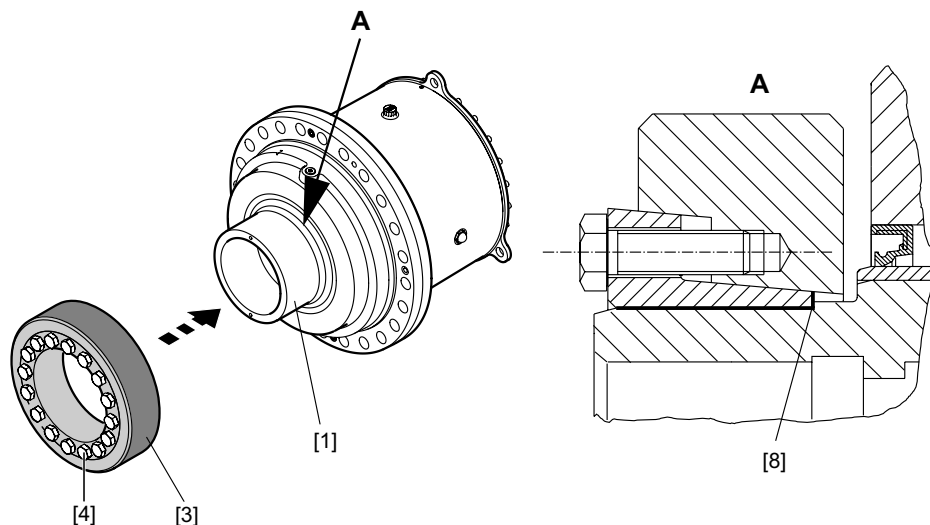


NOTICE

Tightening the screws [4] without installed shaft may result in the hollow shaft being deformed.

Potential damage to property.

- Tighten the locking screws [4] when the machine shaft [2] is installed.



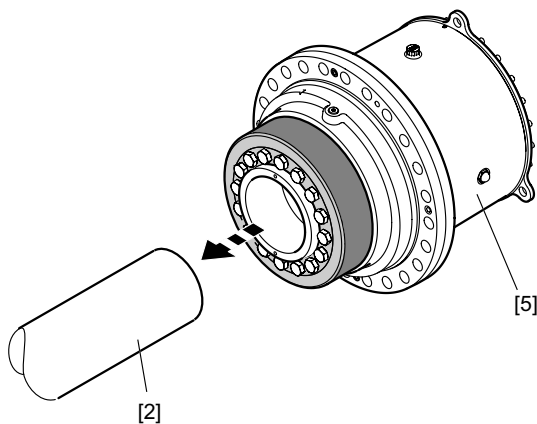
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Installation/Assembly

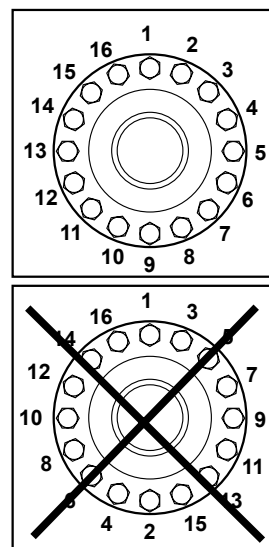
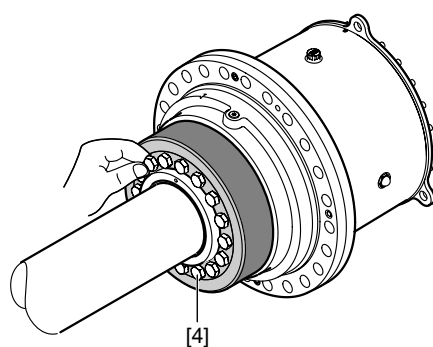
Hollow shaft and shrink disk

5. Install the machine shaft [2] or slide the gear unit [5] to a stop on the machine shaft [2]. Perform the mounting sequence slowly to allow the compressed air to escape around the outside of the shaft.



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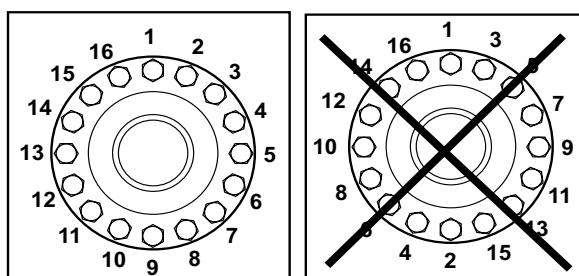
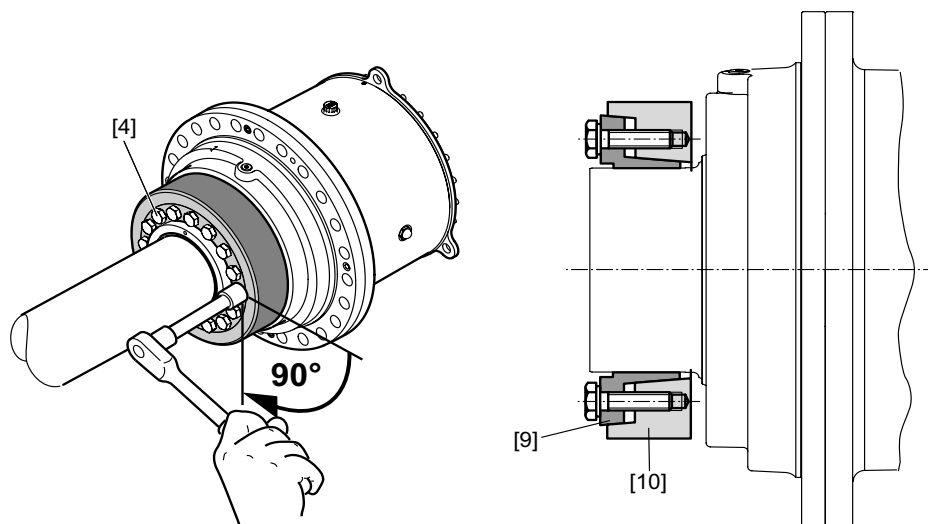
6. Tighten the locking screws [4] manually first. Tighten all locking screws by working round equally (not in diametrically opposite sequence) in 1/4 turn increments.



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7. Observe the tightening torque in the table below. Tighten the locking screws [4] by continuing to work round in 1/4 turns until you reach the tightening torque. Additionally, you can visually check to see that the front lateral surfaces are aligned to the inner [9] and outer rings [10].



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Verify the type details on your shrink disk and choose the tightening torque.

Shrink disk type	Size	Screws	Rated torque [Nm]	Tightening torque [Nm] $\pm 20\%$
3191	P002	M16	41000	250
3181	P012	M16	75500	290
	P022	M16	95500	290
	P032	M20	134000	570
	P042	M20	194000	570
	P052	M20	255000	570
	P062	M24	405000	980
	P072	M24	525000	980
	P082	M24	720000	980



5.10.2 Removal



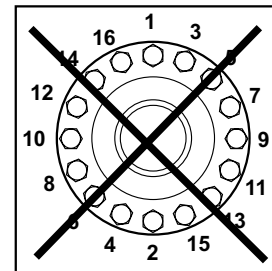
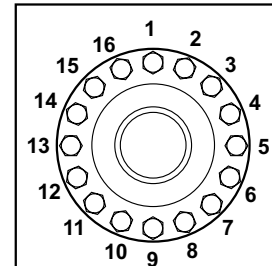
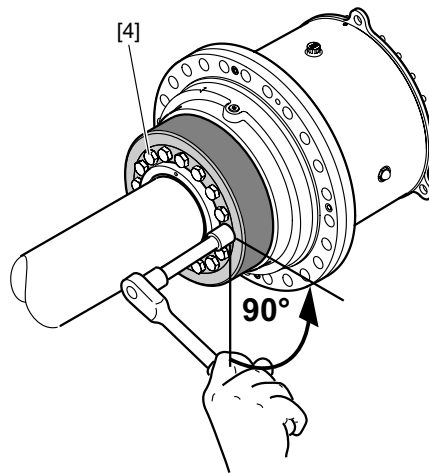
CAUTION

Risk of jamming and crushing due to improper removal of heavy components.

Risk of injuries!

- Remove the shrink disk correctly. Never completely unscrew the retaining screws because the shrink disk might jump off and cause an accident.
- Observe the following removal note.

1. Loosen the locking screws [4], working around in 1/4 turns for each screws.



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If the inner and outer ring do not loosen from each other, unscrew as many locking screws [4] as there are forcing threads and screw these equally into the forcing threads until the tapered bushing is pushed out of the tapered ring.



CAUTION

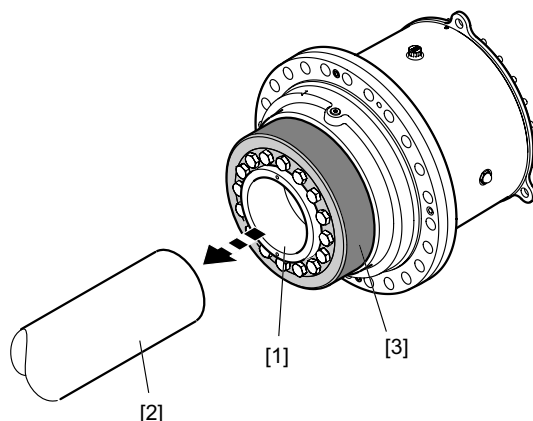
The outer ring of the shrink disk can jump off when it is removed incorrectly.

Risk of injuries!

- Under no circumstances should more locking screws [4] be unscrewed than there are forcing threads present.



2. Remove the machine shaft [2] or pull the hub [1] off the customer shaft (first, remove any corrosion, which may have formed between the hub and the shaft end).



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3. Remove the shrink disk [3] from the hub [1].

5.10.3 Cleaning and lubrication



NOTICE

Improper cleaning and lubrication may result in damages to the shrink disk.

Potential damage to property.

- You must perform the following steps carefully in order to ensure that the shrink disk functions perfectly. Use only products that are comparable to the lubricant that is given.

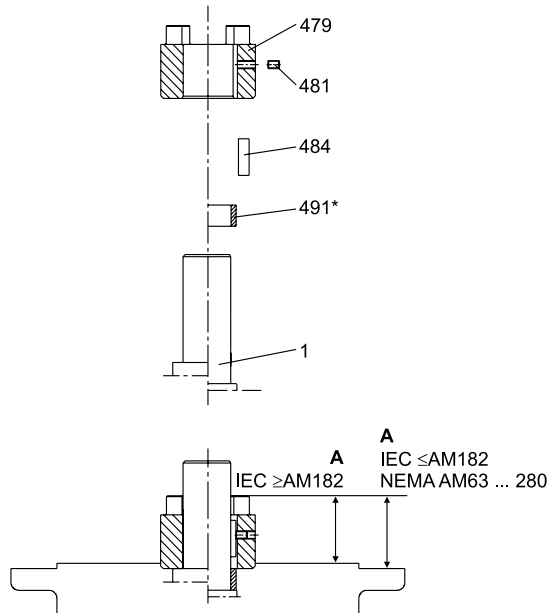
- If the tapered surfaces of the shrink disk are damaged, the shrink disk can no longer be used and must be replaced.
- Do not disassemble and regrease the removed shrink disk before installing it again. Only clean the shrink disk if it is contaminated.
- Next, regrease only the inner sliding surfaces of the shrink disk.
- Use a solid lubricant with a friction factor of $\mu = 0.04$.

Lubricant	Sold as
Molykote 321 R (lube coat)	Spray
Molykote spray (powder spray)	Spray
Molykote G Rapid	Spray or paste
Aemasol MO 19R	Spray or paste
Molykombin UMFT 1	Spray
Unimoly P5	Powder



5.11 Coupling of AM adapter

5.11.1 IEC adapter AM63 – 280 / NEMA adapter AM56 – 365



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- [1] Motor shaft
- [479] Coupling half
- [481] Setscrew
- [484] Key
- [491] Spacer tube

1. Clean the motor shaft and the flange surfaces of the motor and the adapter.
2. Remove the key from the motor shaft and replace it with the supplied key [484] (not AM63 and AM250).
3. Heat the coupling half [479] to approx. 80 - 100 °C and push the coupling half onto the motor shaft. Position as follows:
 - IEC adapter AM63 – 225 until stop at motor shaft shoulder.
 - IEC adapter AM250 – 280 to dimension **A**.
 - NEMA adapter with spacer tube [491] to dimension **A**.
4. Secure the key and coupling half using the setscrew [481] and tightening torque T_A according to the table on the motor shaft.



5. Check the dimension **A**.
6. Seal the contact surfaces between the adapter and motor using a suitable sealing compound.
7. Mount the motor on the adapter. Ensure that the coupling claw of the adapter shaft is engaged in the plastic cam ring.

IEC AM	63 / 71	80 / 90	100 / 112	132	160 / 180	200	225	250 / 280
A	24.5	31.5	41.5	54	76	78.5	93.5	139
T_A	1.5	1.5	4.8	4.8	10	17	17	17
Thread	M4	M4	M6	M6	M8	M10	M10	M10
NEMA AM	56	143 / 145	182 / 184	213 / 215	254 / 256	284 / 286	324 / 326	364 / 365
A	46	43	55	63.5	78.5	85.5	107	107
T_A	1.5	1.5	4.8	4.8	10	17	17	17
Thread	M4	M4	M6	M6	M8	M10	M10	M10



TIP

To avoid contact corrosion, we recommend applying NOCO[®] Fluid to the motor shaft before mounting the coupling half.



NOTICE

Dampness might enter the adapter when mounting a motor to the adapter.

Potential damage to property

- Seal adapter with anaerobic fluid seal



Permitted loads

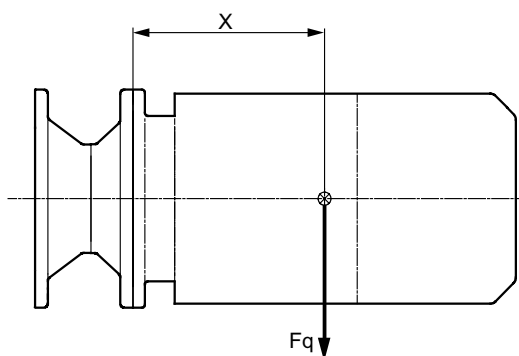


NOTICE

Impermissibly high loads may occur when mounting a motor.

Potential damage to property

- The load data specified in the following table are not to be exceeded.



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Adapter type		$x^1)$ [mm]	$F_q^{1)}$ [N]	
IEC	NEMA		IEC adapter	NEMA adapter
AM63/71	AM56	77	530	410
AM80/90	AM143/145	113	420	380
AM100/112	AM182/184	144	2000	1760
AM132 ²⁾	AM213/215 ²⁾	186	1600	1250
AM132..	AM213/215		4700	3690
AM160/180	AM254/286	251	4600	4340
AM200/225	AM324-AM365	297	5600	5250
AM250/280	-	390	11200	-

- The maximum permitted weight of the attached motor F_{qmax} must be reduced linearly as the center of gravity distance x increases. If this distance is reduced, the maximum permitted weight F_{qmax} cannot be increased.
- Diameter of the adapter output flange: 160 mm



AM../RS adapter
AM with backstop

Check the direction of rotation of the drive prior to assembly or startup. Please inform the SEW-EURODRIVE service in the case of incorrect direction of rotation.

The backstop is maintenance-free in operation, and does not require any further maintenance work. Backstops have a minimum lift-off speed depending on the size (see following table).



CAUTION!

If the actual speed level is below the minimum lift-off speed level, the backstops are subject to wear, and the resulting friction causes the temperature to increase.

Potential damage to property!

- In rated operation, the lift-off speeds must not drop below the minimum values.
- During startup or braking, the lift-off speeds may drop below the minimum levels.

Type	Maximum locking torque of backstop [Nm]	Minimum lift-off speed [rpm]
AM80/90/RS, AM143/145/RS	45	800
AM100/112/RS, AM182/184/RS	200	670
AM132/RS, AM213/215/RS	470	660
AM160/180/RS, AM254/286/RS	630	550
AM200/225/RS, AM324-365/RS	1430	600

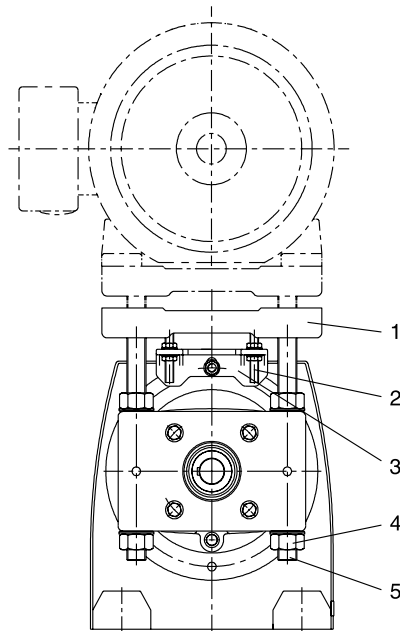


5.12 AD input shaft assembly

Observe chapter "Mounting input and output components" (see page) when installing input components.

5.12.1 Cover with motor mounting platform AD.. / P

Mounting the motor and adjusting the motor mounting platform.



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- [1] Motor mounting platform
- [2] Stud bolt (only AD6/P / AD7/P)
- [3] Support (only AD6/P / AD7/P)

- [4] Nut
- [5] Threaded column

1. Set the motor mounting platform to the required mounting position by evenly tightening the adjusting nuts. Remove the lifting eyebolt from helical gear units in order to achieve the lowest adjustment position. Touch up any damage to the paint work.
2. Align the motor on the motor mounting platform (shaft ends must be in alignment) and secure it.
3. Mount the input elements on the input shaft end and the motor shaft, line them up with one another and correct the motor position again, if necessary.
4. Put on the traction elements (V-belt, chain, etc.) and apply a preload by evenly adjusting the motor mounting platform. Do not stress the motor mounting platform and the columns against each other when doing this.
5. Tighten all the nuts not used for adjustment in order to fix the threaded columns.



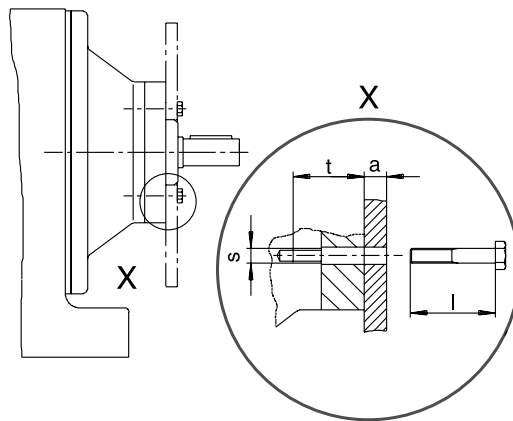
5.12.2 Only AD6/P and AD7/P

Unscrew the nuts on the stud bolts before adjustment to allow the stud bolts to move axially in the support without restriction. Do not tighten the nuts until the final adjustment position has been reached. Do not adjust the motor mounting platform using the support.

5.12.3 AD../ZR input shaft assembly with centering shoulder

Mounting applications on the input shaft assembly with centering shoulder.

1. Retaining bolts of a suitable length must be used to secure the application. The length l of the new bolts is calculated as follows:



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- [l] $t+a$
- [t] Screw-in depth (see table)
- [a] Thickness of the application
- [s] Retaining thread (see table)

Round down the calculated screw length to the next smaller standard length.

2. Remove the retaining screws from the centering shoulder.
3. Clean the contact surface and the centering shoulder.
4. Clean the threads of the new bolts and apply a bolt locking compound (e.g. Loctite® 243) to the first few threads.
5. Attach the application to the centering shoulder and tighten the retaining screws with the specified tightening torque T_A (see table).

Type	Screw-in depth t [mm]	Retaining thread s	Tightening torque T_A for connection screws of strength class 8.8 [Nm]
AD2/ZR	25.5	M8	25
AD3/ZR	31.5	M10	48
AD4/ZR	36	M12	86
AD5/ZR	44	M12	86
AD6/ZR	48.5	M16	210
AD7/ZR	49	M20	410
AD8/ZR	42	M12	86



Permitted loads

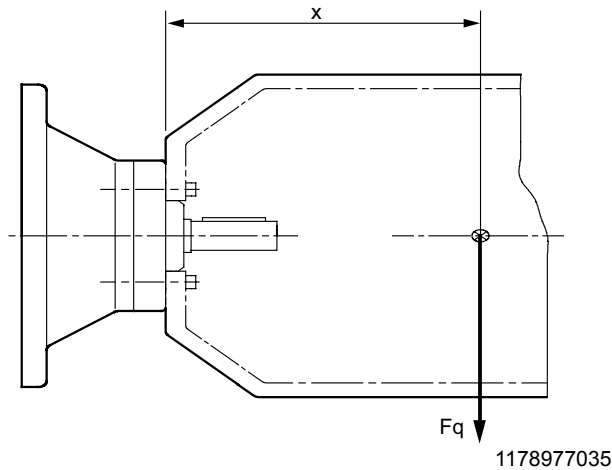


CAUTION!

Impermissibly high loads may occur when mounting a motor.

Potential damage to property!

- The load data specified in the following table are not to be exceeded.



Type	$x^{1)}$ [mm]	$F_q^{1)}$ [N]
AD2/ZR	193	330
AD3/ZR	274	1400
AD4/ZR ²⁾	361	1120
AD4/ZR		3300
AD5/ZR	487	3200
AD6/ZR	567	3900
AD7/ZR	663	10000
AD8/ZR	516	4300

- Maximum load values for connection screws of strength class 8.8. The maximum permitted weight of the attached motor F_{qmax} must be reduced linearly as the center of gravity distance x increases. When this distance is reduced, F_{qmax} cannot be increased.
- Diameter of the adapter output flange: 160 mm



5.12.4 AD../RS input shaft assembly with backstop

Check the direction of rotation of the drive prior to assembly or startup. Inform the SEW-EURODRIVE service in the case of incorrect direction of rotation.

The backstop is maintenance-free in operation, and does not require any further maintenance work. Backstops have a minimum lift-off speed depending on the size (see following table).



NOTICE

If the actual speed level is below the minimum lift-off speed level, the backstops are subject to wear, and the resulting friction causes the temperature to increase.

Potential damage to property.

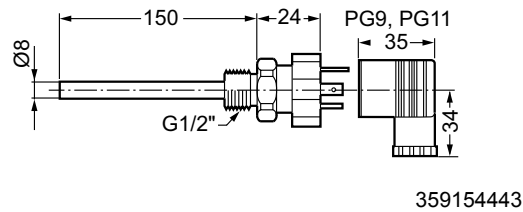
- In rated operation, the lift-off speeds must not drop below the minimum values.
- During startup or braking, the lift-off speeds may drop below the minimum levels.

Type	Maximum locking torque backstop [Nm]	Minimum lift-off speed [1/min]
AD2/RS	45	800
AD3/RS	200	670
AD4/RS	470	660
AD5/RS	630	550
AD6/RS	1430	600
AD7/RS	1430	600
AD8/RS	1430	600

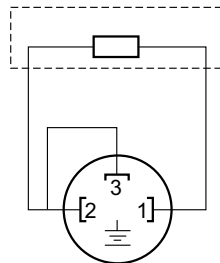


5.13 Temperature sensor PT100

5.13.1 Dimensions



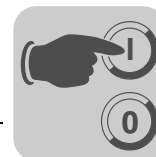
5.13.2 Electrical connection



[1] [2] Resistor element connection

5.13.3 Technical data

- Variant with immersion sleeves and changeable gauge slide
- Sensor tolerance [K] $\pm (0.3 + 0.005 \times T)$, (corresponds to DIN IEC 751 class B),
T = Oil temperature [°C]
- Plug connector: DIN EN 175301-803 PG9 (IP65)
- The tightening torque for the retaining screw in the back of the plug connector for electrical connection is 0.25 Nm.



6 Startup

6.1 Important notes on startup

	NOTICE
	Improper startup may result in damages to the gear unit. Potential damage to property. Note the following:

- RF../KF.. primary gear units are normally delivered with oil fill. Refer to the order documents for discrepancies.
- Check the thermal rating/heating for the following operating conditions:
 - High ambient temperatures (above 45 °C)
 - Mounting position M2/M4 and/or motor speed above 1800 rpm
 Contact SEW-EURODRIVE.
- The most important technical data is included on the nameplate. Additional data relevant for operation is available in drawings, order confirmations or any order-specific documentation.
- Before startup, check that the oil level is correct. Refer to the unit's nameplate for the lubricant volumes.
- After having installed the gear unit, ensure that all retaining screws are tight.
- Make sure that the orientation has not changed after tightening the mounting elements.
- It is absolutely necessary to avoid open flames or sparking when working with the gear unit!
- Ensure that rotating shafts as well as couplings are equipped with suitable protective covers.
- If there are any oil drain valves, ensure that they cannot be opened unintentionally.
- If an oil sight glass is used, ensure that it is protected against damage.
- Protect the gear unit from falling objects.
- For gear units with long-term protection: Replace the screw plug at the location indicated on the gear unit with a breather plug (position → see order documents).
- Make sure that the monitoring devices are functioning before you start up the unit.
- Strictly observe the safety notes in the individual chapters.



6.2 Run-in period

SEW-EURODRIVE recommends running-in the gear unit as first startup phase. Increase load and revolutions in 2 to 3 steps up to maximum level. The running-in phase takes about 10 hours.

Check the following points during the running-in phase:

- Verify the power values specified on the nameplate at startup because their level and frequency may be a decisive factor for the service life of the gear unit.
- Does the gear unit run smoothly?
- Are there vibrations or unusual running noise?
- Are there signs of oil leakages on the gear unit?
- Check to be sure that the additional devices (such as oil pump, cooler, etc.) are functioning properly.

	TIP
	For detailed information and troubleshooting, refer to the "Malfunctions" chapter.

6.3 Startup of gear units with long-term protection

Adhere to the following points for gear units with long-term protection:

6.3.1 Anti-corrosion agent

You must clean the output shafts and flange surfaces thoroughly to ensure they are free of anti-corrosion agents, contamination or similar. Use a commercially available solvent. Do not expose the sealing lips of the oil seals to the solvent – damage to the material.

6.3.2 Oil level

Since the planetary gear units with "long-term protection" are delivered complete with oil, the correct oil volume and oil level should be checked before startup.

→ Correct the oil level to the appropriate fill level.

6.3.3 Breather plug

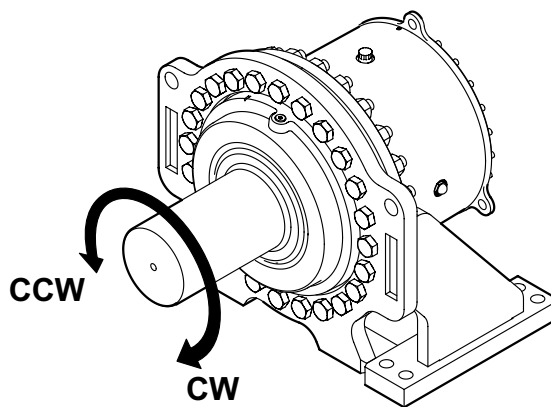
Replace the screw plug by the enclosed breather filter.



6.4 Gear units with backstop

The backstop is integrated in the AD../RS input shaft assembly. The purpose of it is to prevent undesirable reverse rotation. During operation, the backstop permits rotation in one specified direction of rotation only.

	NOTICE
	Operating the motor in the direction that is blocked could destroy the backstop. Potential damage to property. • Do not start up the motor in the blocking direction. Be sure that the motor power supply is correctly attached so that the motor rotates in the required direction. • The backstop can be operated in blocking direction with half the output torque once for control purposes.



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The direction of rotation is determined with a view to the output shaft (LSS).

- Clockwise (CW)
- Counterclockwise (CCW)

The permitted direction of rotation is indicated on the housing.



6.5 Measuring the surface and oil temperature

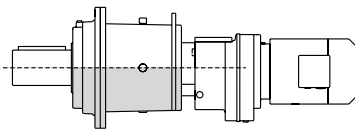
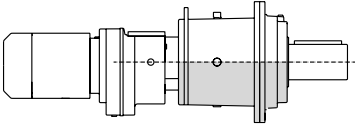
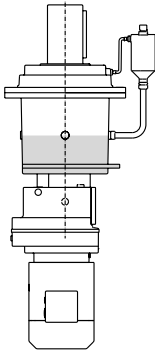
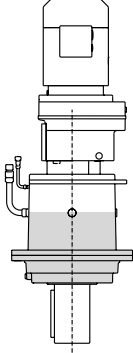
6.5.1 Measuring the surface temperature

It is essential to measure the surface temperature under maximum load when starting up the gear unit.

The measurement can be made using commercially available thermometers. The surface temperature must be measured in a steady state condition. It may not exceed 100 °C.

Stop the drive immediately if the temperature is above this value. Consult SEW-EURODRIVE.

The measuring of the surface temperature depends on the mounting position of the planetary gear unit. The area marked in gray shows where the surface temperature of the gear unit must be measured.

Mounting position	Measuring point of the surface temperature
M1	 1407712779
M3 M5 M6	 1407716363
M2	 1407720075
M4	 1407761675



6.5.2 Measuring the oil temperature

Oil temperatures must be measured to determine the oil change intervals. See chapter "Lubricant change intervals" (see page) for a description. Measure the temperature at the bottom of the gear unit. If the gear unit has an oil drain plug, measure the temperature on this plug. Add 10 K to the measured value. This value is the basis for the oil change intervals.

6.6 Shutting down gear units

	! DANGER Risk of crushing if the drive starts up unintentionally. Severe or fatal injuries. • Disconnect the gearmotor from the power supply before starting work and protect it against unintentional re-start.
--	--

If the gear unit will not operated for an extended period of time, you must activate it regularly at intervals of approx. 2-3 weeks.

If the gear unit will not operated for a period **longer than 9 months**, additional corrosion protection is required:

- **Internal corrosion protection:**
 - Fill the gear unit up to the breather plug with the oil grade specified on the nameplate.
 - Set the gear unit in no-load running operation for a short period of time at regular intervals.

	TIP If this method of corrosion protection is not possible, the interior of the gear unit should be sealed and protected with a suitable corrosion protection agent. Consult with the respective supplier regarding the compatibility with the oil that is used and the length of corrosion protection for your particular gear unit version.
--	--

- **Exterior corrosion protection:**
 - Clean the surfaces.
 - Grease the shaft near the sealing lip to separate the sealing lip of the oil seal and the corrosion protectant.
 - Apply a wax-based protective coating to shaft ends and unpainted surfaces as external corrosion protection.

	TIP Refer to the "Startup" section before re-starting the gear unit.
--	---



7 Inspection/Maintenance

7.1 Preliminary work regarding inspection/maintenance

Observe the following notes before you start with the inspection/maintenance work.

	! DANGER Risk of crushing if the drive starts up unintentionally. Severe or fatal injuries. • De-energize the motor before you start working on the unit. • Secure the motor against unintended power-up.
	! WARNING Danger of burns due to hot gear unit and hot gear unit oil. Fatal injuries. • Let the gear unit cool down before you start working on it. • Only remove the oil level and oil drain plug very carefully.
	NOTICE Filling in the wrong oil may result in significantly different lubricant characteristics. Potential damage to property • Do not mix different synthetic lubricants and do not mix synthetic with mineral lubricants.
	NOTICE Improper maintenance may result in damages to the gear unit. Potential damage to property. • Note the following:

- Strict adherence to the inspection and maintenance intervals is absolutely necessary to ensure safe working conditions.
- Observe the tightening torques.
- When using primary gearmotors, also observe the maintenance notes for motors and primary gear units in the accompanying operating instructions.
- For the position of the oil level plug, oil drain plug and the breather valve, refer to the mounting position sheets. see chapter "Mounting positions".
- Use only original spare parts according to the delivered spare and wearing parts lists.
- Before releasing shaft connections, be sure that there are no active torsional moments present (tensions within the system).



- Prevent foreign bodies from entering into the gear unit during the following work.
- Do not clean the gear unit with a high-pressure cleaning system. If one is used, water may enter into the gear unit and the seals may be damaged.
- Perform safety and function tests following all maintenance and repair work.
- Strictly observe the safety notes in the individual chapters.

7.2 Inspection and maintenance intervals

7.2.1 P.. planetary gear units

Time interval	Required maintenance/inspection steps
• Daily	• Check the housing temperature: • With mineral oil: max. 90 °C • With synthetic oil: max. 100 °C • Check gear unit noise
• Monthly	• Check gear unit for signs of leakage • Checking the oil level (section 7.4)
• After 500 hours of operation	• First oil change after initial startup (section 7.6)
• Every 3000 operating hours, at least every 6 months	• Checking the oil consistency (section 7.5) • Fill regreasable sealing systems with grease (section 7.8).
• Depending on the operating conditions, at least every 12 months	• Check whether retaining screws are tightly secured • Check the condition of the oil/water cooling system • Clean oil filter, replace filter element if necessary • Checking the breather plug, replacing it if required (section 7.7) • Checking the alignment of the input and output shaft (chapter 5.6)
• Depending on the operating conditions (see chapter 7.3), every 3 years at the latest.	• Changing the mineral oil
• Depending on the operating conditions (see chapter 7.3), every 5 years at the latest.	• Change synthetic oil
• Varying (depending on external factors)	• Touch up or renew the surfaces/anticorrosion coating



7.2.2 RF/KF primary gear unit

Time interval	Required maintenance/inspection steps
Every 3000 operating hours, at least every 6 months	- Check oil and oil level - Check running noise for possible bearing damage - Visually check the seals for leakage
- Depending on the operating conditions, every 3 years at the latest - According to oil temperature	- Change mineral oil - Replace anti-friction bearing grease (recommendation) - Replace oil seal (do not install it in the same track)
- Depending on the operating conditions, every 5 years at the latest - According to oil temperature	- Change synthetic oil - Replace anti-friction bearing grease (recommendation) - Replace oil seal (do not install it in the same track)
Varying (depending on external factors)	Touch up or renew the surfaces/anticorrosion coating

7.2.3 AL/AM adapter

Time interval	Required maintenance/inspection steps
Every 3000 operating hours, at least every 6 months	- Check torsional play - Visually check the elastic annular gear - Check running noise for possible bearing damage - Visually check the adapter for leakage
After 25 000 – 30 000 hours of operation	- Renew the anti-friction bearing grease - Replace oil seal (do not install it in the same track) - Change the elastic annular gear

7.2.4 AD input shaft assembly

Time interval	Required maintenance/inspection steps
Every 3000 operating hours, at least every 6 months	- Check running noise for possible bearing damage - Visually check the adapter for leakage
After 25 000 – 30 000 hours of operation	- Renew the anti-friction bearing grease - Replace the oil seal



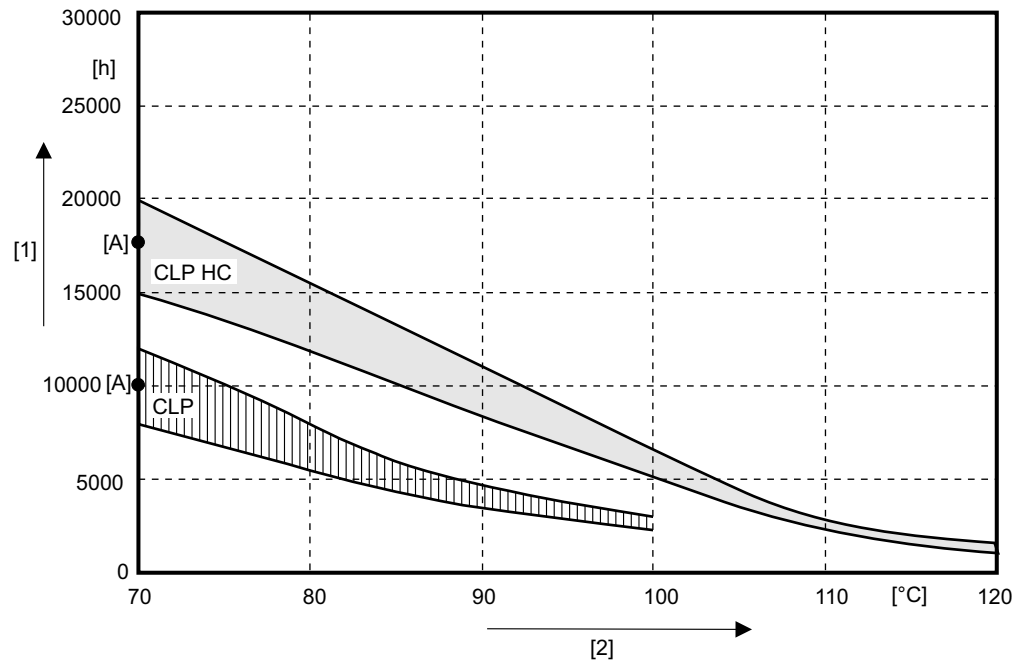
7.3 Lubricant change intervals

Change the oil more frequently when using special designs subject to more severe/aggressive ambient conditions.



TIP

Mineral CLP lubricants and synthetic polyalphaolefin-based (PAO) lubricants are used for lubrication. The synthetic lubricant CLP HC (according to DIN 51502) shown in the following illustration corresponds to the PAO oils.



[1] Operating hours

[2] Sustained oil bath temperature

● Average value per oil type at 70 °C



TIP

In order to optimize the lubrication change intervals, SEW-EURODRIVE recommends that the gear unit oil be analyzed regularly (see section 7.5).



7.4 Checking the oil level



NOTICE

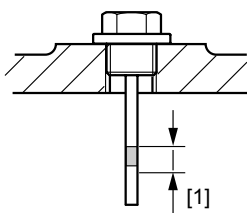
Improper checking of the oil level may result in damages to the gear unit.

Potential damage to property.

- Check the oil level only when the gear unit has come to a standstill and a waiting period of 5 min has elapsed. This ensures that the oil accumulates in the gear unit interior.

7.4.1 Gear units with oil dipstick

1. Observe the notes in section "Preliminary work regarding inspection/maintenance" (see page 62).
2. Unscrew the oil dipstick and remove it.
3. Clean the oil dipstick and re-insert it by turning it hand-tight into the gear unit up to the stop.
4. Remove the oil dipstick and check the oil level.



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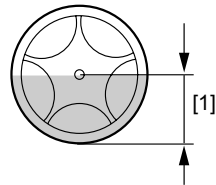
[1] The oil level must be within this range

5. Proceed as follows if the oil level is too low:
 - Open the oil fill plug.
 - Fill in new oil of the same type via the oil fill plug up to the mark.
 - Screw in the oil fill plug.
6. Re-insert the oil dipstick.



7.4.2 Gear unit with oil sight glass

1. Observe the notes in section "Preliminary work regarding inspection/maintenance" (see page 62).
2. Check the oil level according to the following figure.



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[1] The oil level must be within this range

3. Proceed as follows if the oil level is too low:
 - Open the oil fill plug.
 - Fill in new oil of the same type via the oil fill plug up to the mark.
 - Screw in the oil fill plug.

7.5 Checking the oil consistency

1. Observe the notes in section "Preliminary work regarding inspection/maintenance" (see page 62).
2. Determine the position of the oil drain plug and place a container underneath.
3. Unscrew the oil drain plug slowly and take an oil sample.
4. Re-insert the oil drain plug.
5. Check the oil consistency:
 - For more detailed information on checking the oil for water content and viscosity, contact your lubricant manufacturer.
 - If you can see that the oil is heavily contaminated, change the oil even if this is outside of the specified oil change intervals.



7.6 Changing the oil

7.6.1 Notes



NOTICE

Improper oil change may result in damages to the gear unit.

Potential damage to property.

- Note the following:

- When changing the oil, always refill the gear unit with the grade of oil that was used before. Mixing oils of different grades and/or manufacturers is not permitted. Especially synthetic oils may not be mixed with mineral oils or other synthetic oils. Flush the gear unit with the new oil grade thoroughly when switching from mineral oil or when switching from synthetic oil of one basis to synthetic oil of a different basis.
- Refer to the lubrication table in section 9.2 to determine which oils from the various lubricant manufacturers can be used.
- Information such as the oil grade, oil viscosity and required oil quantity is listed on the nameplate of the gear unit. The oil quantity specified on the nameplate is an approximate quantity. The mark on the oil sight glass or stick is the decisive indicator of the correct oil level.
- Only change the oil when the gear unit is warm.
- When changing the oil, flush the gear unit interior thoroughly with oil to remove oil sludge, oil residue, and abrasion products. Use the same grade of oil that is used to operate the gear unit. Fill with fresh oil only after all residues have been removed.
- For the position of the oil level plug, oil drain plug and the breather valve, refer to the order documents.
- Dispose of the used oil in accordance with applicable regulations.



7.6.2 Procedure



! WARNING

Danger of burns due to hot gear unit and hot gear unit oil.

Fatal injuries.

- Let the gear unit cool down before you start working on it.
- However, the gear unit must still be warm, otherwise the high viscosity of excessively cold oil will make it harder to drain the oil correctly.

1. Observe the notes in section "Preliminary work regarding inspection/maintenance" (see page 62).
2. Place a container underneath the oil drain plug.
3. Remove the oil drain plug.
4. Remove the oil fill plug or the breather valve.
If a gear unit has no oil fill plug depending on the mounting position, the breather valve is used as oil filling hole.
5. Drain all the oil.
6. Re-insert the oil drain plug.
7. Fill in new oil of the same grade via the oil filling hole.
 - Use a funnel to fill the oil (filter mesh max. 25 µm).
 - Pour in the oil quantity in accordance with the specification on the nameplate. The oil volume specified on the nameplate is an approximate value.
 - Check whether the oil level is correct using the oil sight glass/oil dipstick.
 - When using an external oil/air or oil/water cooling system, observe the separate operating instructions.
8. Screw in the oil fill plug or the breather valve.



TIP

Any dripping oil must be removed immediately with an oil binding agent.



7.7 Checking and cleaning the breather plug


NOTICE

Improper cleaning may result in damages to the gear unit.

Potential damage to property.

- Prevent foreign objects from entering into the gear unit.

1. Remove any deposits located near the breather plugs.
2. Replace clogged breather plugs with new ones.

7.8 Refilling grease

Regreasable sealing systems may be refilled with lithium-soap grease (see section 9.4). Use moderate pressure to force grease into each lubrication point until new grease leaks out of the sealing gap.

Used grease, including contaminants and sand, is thus pressed out of the sealing gap.


TIP

Remove the old grease that leaked out.



8 Malfunctions

8.1 Notes on malfunctions

Observe the following notes before you start to determine the reason for the malfunction.

	! DANGER
	Risk of crushing if the drive starts up unintentionally. Severe or fatal injuries. • De-energize the motor before you start working on the unit. • Secure the motor against unintended power-up.

	! WARNING
	Danger of burns due to hot gear unit and hot gear unit oil. Fatal injuries. • Let the gear unit cool down before you start working on it.

	NOTICE
	Improper handling of the gear unit and the motor may lead to damages. Potential damage to property. • Any repair work on SEW drives may be performed by qualified personnel only. • Only qualified personnel is permitted to separate drive and motor. • Consult SEW-EURODRIVE customer service.

8.2 Customer service

Please have the following information available if you require customer service assistance:

- Complete nameplate data
- Type and extent of the problem
- Time the problem occurred and any accompanying circumstances
- Assumed cause
- A digital photograph if possible



8.3 Malfunctions of P.. planetary gear units

Fault	Possible cause	Remedy
Unusual, regular running noise	- Meshing/grinding noise: Bearing damage - Knocking noise: Irregularity in the gearing - Deformation of the housing upon tightening - Noise generation caused by insufficient rigidity of the gear unit foundation	- Check oil consistency (see chapter 7.5), replace bearings - Contact customer service - Check the gear unit mounting for possible deformation and correct if needed - Reinforce the gear unit foundation
Unusual, irregular running noise	Foreign objects in the oil	- Check the oil consistency (see section 7.5) - Stop the drive, contact customer service
Unusual noise in the area of the gear unit mounting	Gear unit mounting has loosened	- Tighten retaining screws and nuts to the specified torque - Replace the damaged/defective retaining screws or nuts
Operating temperature too high	- Too much oil - Oil too old - The oil is heavily contaminated - Ambient temperature is too high	- Check the oil level, correct if necessary (see section 7.4) - Check when the oil was changed last time; change the oil if necessary (see section 7.6) - Protect from external heat sources (e.g. provide shade) - Change the oil (see section 7.6)
Bearing point temperatures too high	- Not enough oil - Oil too old - Bearing damaged	- Check the oil level, correct if necessary (see section 7.4) - Check when the oil was changed last time; change the oil if necessary (see section 7.6) - Check bearing and replace if necessary, contact customer service
Oil is leaking ¹⁾	- Gasket on the gear unit is not tight - Sealing lip of the oil seal turned up - Oil seal damaged/worn - Too much oil - Drive installed in incorrect mounting position - Frequent cold starts (oil foams) and/or high oil level	- Vent the gear unit, observe the gear unit. If oil still leaks: Contact customer service - Check shaft end ring; replace if necessary - Contact customer service - Check oil level (see chapter 7.4) - Install the breather plug correctly

1) During the run-in phase (24-hour run time), it is normal for (small amounts of) oil/grease to leak from the oil seal (see also DIN 3761).



8.4 Malfunctions of RF/KF primary gear units

Fault	Possible cause	Remedy
Unusual, regular running noise	Meshing/grinding noise: Bearing damage	Check the oil → replace the bearing
	Knocking noise: Irregularity in the gearing	Contact customer service
Unusual, irregular running noise	Foreign objects in the oil	- Checking the oil - Stop the drive, contact customer service
Oil is leaking ¹⁾ - At the inspection cover - At the motor flange - At the motor oil seal - At the gear unit flange - At the output end oil seal	Rubber seal on the inspection cover leaking	Tighten the screws on the gear cover plate and observe the gear unit. If oil still leaks: Contact customer service
	Seal defective	Contact customer service
	Gear unit not ventilated	Vent gear unit
Oil leaking from breather valve	Too much oil	Correct the oil level
	Drive operated in incorrect mounting position	- Install the breather valve correctly - Correcting the oil level
	Frequent cold starts (oil foams) and/or high oil level.	Use an oil expansion tank
Output shaft does not turn although the motor is running or the input shaft is rotated	Connection between shaft and hub in gear unit interrupted	Send in the gear unit/gearmotor for repair.
Operating temperature at backstop too high	Damaged / defective backstop	- Check backstop; replace if necessary - Contact customer service
No blocking function		

1) Short-term oil / grease leakage at the oil seal is possible in the run-in phase (48 hours running time).

8.5 Malfunctions of AM/AL adapters

Fault	Possible cause	Remedy
Unusual, regular running noise	Meshing/grinding noise: Bearing damage	Contact SEW-EURODRIVE customer service
Oil is leaking	Seal defective	Contact SEW-EURODRIVE customer service
Output shaft does not turn although the motor is running or the input shaft is rotated	Connection between shaft and hub in gear unit interrupted	Send in gear unit to SEW-EURODRIVE for repair
Change in running noise and/or vibrations	Annular gear wear, short-term torque transfer through metal contact	Change the annular gear
	Bolts to secure hub axially are loose	Tighten the screws
Premature wear in annular gear	- Contact with aggressive fluids / oils; ozone influence; too high ambient temperatures etc, which can cause a change in the physical properties of the annular gear. - Impermissibly high ambient/contact temperature for the annular gear; maximum permitted temperature: -20 °C to +80 °C - Overload	Contact SEW-EURODRIVE customer service



8.6 Malfunctions of the motor

Fault	Possible cause	Remedy
Motor does not start up	Supply cable interrupted	Check connections, correct if necessary
	Brake does not release	→ see the motor operating instructions
	Fuse has blown	Replace fuse
	Motor protection has triggered	Check motor protection for correct setting, correct error if necessary
	Motor protection does not switch, error in control	Check motor protection control, correct error if necessary
Motor only starts with difficulty or does not start at all	Motor designed for delta connection but used in star connection	Correct connection
	Voltage or frequency deviate considerably from setpoint, at least while being switched on	Provide better power supply system; check cross section of supply cable
Motor does not start in star connection, only in delta connection	Star connection does not provide sufficient torque	Switch on directly if delta inrush current is not too great; else, use a larger motor or a special design (contact SEW-EURODRIVE)
	Contact fault on star/delta switch	Rectify fault
Incorrect direction of rotation	Motor connected incorrectly	Swap over two phases
Motor hums and has high current consumption	Brake does not release	→ see the motor operating instructions
	Winding defective	Send motor to specialist workshop for repair
	Rotor rubbing	
Fuses blow or motor protection trips immediately	Short circuit in line	Repair short circuit
	Short circuit in motor	Send motor to specialist workshop for repair
	Lines connected incorrectly	Correct connection
	Ground fault on motor	Send motor to specialist workshop for repair
Severe speed loss under load	Overload	Measure power, use larger motor or reduce load if necessary
	Voltage drops	Increase cross section of incoming cable
Motor heats up excessively (measure temperature)	Overload	Measure power, use larger motor or reduce load if necessary
	Insufficient cooling	Correct cooling air supply or clear cooling air passages, retrofit forced cooling fan if necessary
	Ambient temperature is too high	Comply with permitted temperature range
	Motor in delta connection instead of star connection as provided for	Correct connection
	Loose contact in supply cable (one phase missing)	Rectify loose contact
	Fuse has blown	Look for and rectify cause (see above); replace fuse
	Mains voltage deviates from the rated motor voltage by more than 5 %. A higher voltage has a particularly unfavorable effect in motors with a low-speed winding since in these, the no-load current is already close to the rated current even when the voltage is normal.	Adjust motor to supply voltage.
	Rated operation type (S1 to S10, DIN 57530) exceeded, e.g. through excessive starting frequency	Adjust the rated operating mode of the motor to the required operating conditions; consult a professional to determine the correct drive if necessary
Excessively loud	Ball bearing compressed, dirty or damaged	Re-align motor, inspect ball bearing, re-grease, if necessary, replace
	Vibration of rotating parts	Rectify cause, possible imbalance
	Foreign bodies in cooling air passages	Clean cooling air passages



8.7 Malfunctions of DR/DV brakes

Fault	Possible cause	Remedy
Brake does not release	Incorrect voltage on brake control unit	Apply correct voltage
	Brake control unit failed	Install a new brake control system, check internal resistance and insulation of brake coil, check switchgear
	Max. permitted working air gap exceeded because brake lining worn down.	Measure and set working air gap
	Voltage drop on supply cable > 10%	Correct connection voltage; check cable cross section
	Inadequate cooling, brake overheats	Replace type BG brake rectifier with type BGE
	Brake coil has interturn fault or short circuit to exposed conductive part	Replace complete brake and brake control system (specialist workshop), check switchgear
	Rectifier defective	Replace the rectifier and brake coil
Motor does not brake	Working air gap not correct	Measure and set working air gap
	Brake lining worn down	Replace entire brake disk
	Incorrect braking torque.	Change the braking torque (→ see motor operating instructions) • By the type and number of brake springs • Brake BMG 05: by installing the same brake coil body design as in brake BMG 1 • Brake BMG 2: by installing the same brake coil body design as in brake BMG 4
	BM(G) only: Working air gap so large that setting nuts come into contact.	Setting the working air gap
	BR03, BM(G) only: Manual brake release device not set correctly	Set the setting nuts correctly
Brake is applied with time lag	Brake is switched on AC voltage side	Switch on DC and AC voltage sides (e.g. BSR); refer to wiring diagram
Noises in vicinity of brake	Gearing wear caused by jolting startup	Check project planning
		→ see motor operating instructions



9 Lubricants

9.1 Lubricant selection



NOTICE

Selecting improper lubricants may result in damages to the gear unit.

Potential damage to property.

- Note the following:

- The oil viscosity and type (mineral/synthetic) that are to be used are determined by SEW-EURODRIVE specifically for each order. This information is noted in the order confirmation and on the gear unit's nameplate.

You must contact SEW-EURODRIVE in case of a deviation from this specification.

This lubricant recommendation in chapter "Lubricant table" in no way represents a guarantee as to the quality of the lubricant delivered by each respective supplier. Each lubricant manufacturer is responsible for the quality of its product.

- Ensure that the planetary gear units and primary gear units are filled with the correct oil grade and volume before startup. You can obtain the corresponding information from the gear unit nameplate and the lubricant table on the following page.
- The lubricant fill quantity and viscosity with planetary geared motors with shared oil chamber depends only on the information on the nameplate of the planetary gear unit. Planetary gear units and the primary gear units are delivered without oil fill.
- Do not mix different synthetic lubricants and do not mix synthetic with mineral lubricants.



9.2 Permitted lubricants

9.2.1 General information

The lubricant table on the following page shows the permitted lubricants for gear units. Refer to the following legend for the lubricant table.

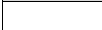
9.2.2 Legend for the lubricant table

Abbreviations, meaning of shading and notes:

CLP = Mineral oil

CLP HC = Synthetic polyalphaolefin

 = Synthetic lubricant (= synthetic-based anti-friction bearing grease)

 = Mineral lubricant (= mineral-based anti-friction bearing grease)

 1) = Ambient temperature

2) Pay attention to critical starting behavior at low temperatures

 Lubricant for the food industry (food grade oil)

 Biodegradable oil (lubricant for agriculture, forestry, and fisheries)

9.2.3 Notes on the lubricant table

	NOTICE
	Selecting improper lubricants may result in damages to the gear unit.
	Potential damage to property. • The temperature ranges are to be considered guide values. The decisive factor is the viscosity information on the nameplate. • Contact SEW-EURODRIVE if you operate the unit under extreme conditions, such as cold, heat, or if the operating conditions differ from those based on the project planning.



Lubricants

Permitted lubricants

9.2.4 Lubricant table

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		ISO VG class	Mobil®										P... R... K...		
-10	CLP	VG 320	Mobilgear XMP 320 Mobilgear 600XP 320	Shell Omala F320	KLÜBER GEM 1-320N	Degol BG 320 Plus	BP Energol GR-XF 320	Meropa 320	Renolin CLP320 Renolin CLP320Plus Renolin High Gear 320	Goya NT 320	Alpha SP 320 Optigear BM 320 Tribol 1100/320	Carter EP 320			
-5	CLP	VG 460	Mobilgear XMP 460 Mobilgear 600XP 460	Shell Omala F460	KLÜBER GEM 1-460N	Degol BG 460 Plus	BP Energol GR-XF 460	Meropa 460	Renolin CLP460 Renolin CLP460Plus Renolin High Gear 460	Goya NT 460	Alpha SP 460 Optigear BM 460 Tribol 1100/460	Carter EP 460			
0	CLP	VG 680	Mobilgear XMP 680 Mobilgear 600XP 680	Shell Omala F680	KLÜBER GEM 1-680N		BP Energol GR-XF 680	Meropa 680	Renolin CLP680 Renolin CLP680Plus Renolin High Gear 680	Goya NT 680	Alpha SP 680 Optigear BM 680 Tribol 1100/680	Carter EP 680			
-15	CLP	VG 220	Mobilgear XMP 220 Mobilgear 600XP 220	Shell Omala F220	KLÜBER GEM 1-220N	Degol BG 220 Plus	BP Energol GR-XF 220	Meropa 220	Renolin Unisyn CLP 220 Renolin High Gear synth 220	Goya NT 220	Alpha SP 220 Optigear BM 220 Tribol 1100/220	Carter EP 220			
-20	CLP	VG150	Mobilgear XMP 150 Mobilgear 600XP 150		KLÜBER GEM 1-150N	Degol BG 150 Plus	BP Energol GR-XF 150	Meropa 150	Renolin CLP 150 Renolin CLP 150 Plus	Goya NT 150	Alpha SP 150 Optigear BM 150 Tribol 1100/150				
-25	CLP HC	VG 320	Mobilgear SHC XMP320 Mobil SHC 632	Shell Omala Oil HD 320	KLÜBER GEM4-320N	Degol PAS 320	BP Energol EP -XF 320	Pinnacle WM 320	Renolin Unisyn CLP 320 Renolin High Gear synth 320	ELGreco 320	Optigear Synthetic X 320 Alphasyn EP 320 Tribol 1510/ 320 Tribol 1710/ 320	Carter SH 320			
-20	CLP HC	VG 460	Mobilgear SHC XMP460 Mobil SHC 634	Shell Omala Oil HD 460	KLÜBER GEM4-460N		BP Energol EP -XF 460	Pinnacle WM 460	Renolin Unisyn CLP 460 Renolin High Gear synth 460	ELGreco 460	Optigear Synthetic X 460 Alphasyn EP 460 Tribol 1510/ 460 Tribol 1710/ 460	Carter SH 460			
-20	CLP HC	VG 680	Mobilgear SHC XMP680 Mobil SHC 636	Shell Omala Oil HD 680	KLÜBER GEM4-680N			Pinnacle WM 680	Renolin Unisyn CLP 680 Renolin High Gear synth 680	ELGreco 680	Optigear Synthetic X 680 Tribol 1510/ 680	Carter SH 680			
-30	CLP HC	VG 220	Mobilgear SHC XMP220	Shell Omala Oil HD 220	KLÜBER GEM 4-220N	Degol PAS 220	BP Energol EP -XF 220	Pinnacle WM 220	Renolin Unisyn CLP 220	ELGreco 220	Optigear Synthetic X 220 Alphasyn EP 220 Tribol 1510/ 220 Tribol 1710/ 220	Carter SH 220			
-35	CLP HC	VG 150	Mobilgear SHC XMP150		KLÜBER GEM 4-150N	Degol PAS 150	BP Energol EP-XF 150	Pinnacle WM 150	Renolin Unisyn CLP 150	ELGreco 150	Optigear Synthetic X 150 Alphasyn EP 150 Tribol 1510/ 150 Tribol 1710/ 150	Carter SH 150			
-20	CLP HC	VG 460		Shell Cassida Fluid GL 460	KLÜBERSYNTH UH1 6-460				Garalyn SF 460		Optileb GT 460				
-20	E	VG 460		Shell Naturelle Gear Fluid EP 460	KLÜBERSYNTH GEM 2-460				Plantogear 460 S						

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9.2.5 Sealing grease

The anti-friction bearings in RF/KF primary gear units and motors are given a factory-fill with the greases listed below. SEW-EURODRIVE recommends regreasing anti-friction bearings with a grease fill at the same time as changing the oil. Observe the separate operating instructions for RF/KF primary gear units and motors.

	Ambient temperature	Manufacturer	Type
Gear unit anti-friction bearings	–40 °C ... +80 °C	Fuchs	Renolit CX-TOM 15
	–30°C ... +40°C	Castrol	Obeen F82
	–20°C ... +40°C	Aral	Aralube BAB EP2



TIP

The following grease quantities are required:

- For fast-running bearings (gear unit input end): Fill the cavities between the rolling elements one-third full with grease.
- For slow-running bearings (gear unit input side): Fill the cavities between the rolling elements two-thirds full with grease.



9.3 Lubricant fill quantities

The specified fill quantities are **recommended values**. The precise values vary depending on the number of stages and gear ratios.

Check the oil level in a planetary gear unit at the oil sight glass or the dipstick and in a primary gear unit at the oil level screw.



TIP

In case of a pivoted mounting position, refer to the oil fill quantity specified on the nameplate.

9.3.1 Planetary gear units

Size	Fill quantity in liters					
	M1	M2	M3	M4	M5	M6
P002	4	7	4	7	4	4
P012	6	11	6	11	6	6
P022	8	14	8	14	8	8
P032	11	20	11	20	11	11
P042	15	29	15	29	15	15
P052	20	38	20	38	20	20
P062	25	48	25	48	25	25
P072	30	58	30	58	30	30
P082	40	83	40	83	40	40

9.3.2 Helical (RF-) primary gear units

The lubricant fill quantity depends on the mounting position of the planetary gear unit and the mounting position of the RF primary gearmotor.

For notes on the mounting positions of RF primary gear units, refer to section 3.4.2.

Delivery of the RF primary gear unit with oil fill.

Size	Fill quantity in liters					
	M1 0°	M2 0°	M3 180°	M4 0°	M5 270°	M6 90°
RF77	1.2	3.10	3.30	3.60	2.40	3.00
RF87	2.4	6.4	7.1	7.2	6.3	6.4
RF97	5.1	11.9	11.2	14.0	11.2	11.8
RF107	6.3	15.9	17.0	19.2	13.1	15.9
RF137	9.5	27.0	29.0	32.5	25.0	25.0
RF147	16.4	47.0	48.0	52.0	42.0	42.0
RF167	26.0	82.0	78.0	88.0	65.0	71.0

Key

M1 / M2 / M3 / M4 / M5 / M6	= Mounting position of planetary gear unit
0° / 90° / 180° / 270°	= Mounting position of primary helical gear unit



9.3.3 Primary bevel (KF-) gear units

The lubricant fill quantity depends on the mounting position of the planetary gear unit and the mounting position of the KF primary gearmotor.

For notes on the mounting positions of KF primary gear units, refer to section 3.4.1.

Delivery of the KF primary gear unit with oil fill.

Size	Fill quantity in liters											
	M1				M2				M3			
	0° A	90° A	180° B	270° A	0° A	90° A	180° A	270° A	0° B	90° A	180° A	270° A
KF67	1.1	2.4	1.1	3.7	2.7	2.7	2.7	2.7	1.1	3.7	1.1	2.4
KF77	2.1	4.1	2.1	5.9	4.5	4.5	4.5	4.5	2.1	5.9	2.1	4.1
KF87	3.7	8.2	3.7	11.9	8.4	8.4	8.4	8.4	3.7	11.9	3.7	8.2
KF97	7.0	14.7	7.0	21.5	16.5	16.5	16.5	16.5	7.0	21.5	7.0	14.7
KF107	10.0	21.8	10.0	35.1	25.2	25.2	25.2	25.2	10.0	35.1	10.0	21.8
KF127	21.0	41.5	21.0	55.0	41.0	41.0	41.0	41.0	21.0	55.0	21.0	41.5
KF157	31.0	66	31.0	92.0	62.0	62.0	62.0	62.0	31.0	92.0	31.0	66.0

Size	Fill quantity in liters											
	M4				M5				M6			
	0° A	90° A	180° B	270° A	0° A	90° B	180° A	270° A	0° B	90° A	180° A	270° B
KF67	2.7	2.7	2.7	2.7	2.4	1.1	3.7	1.1	3.7	1.1	2.4	1.1
KF77	4.5	4.5	4.5	4.5	4.1	2.1	5.9	2.1	5.9	2.1	4.1	2.1
KF87	8.4	8.4	8.4	8.4	8.2	3.7	11.9	3.7	11.9	3.7	8.2	3.7
KF97	15.7	15.7	15.7	15.7	14.7	7.0	21.5	7.0	21.5	7.0	14.7	7.0
KF107	25.2	25.2	25.2	25.2	21.8	10.0	35.1	10.0	35.1	10.0	21.8	10.0
KF127	41.0	41.0	41.0	41.0	41.5	21.0	55.0	21.0	55.0	21.0	41.5	21.0
KF157	62.0	62.0	62.0	62.0	66.0	31.0	92.0	31.0	92.0	31.0	66.0	31.0

Key	
M1 / M2 / M3 / M4 / M5 / M6	= Mounting position of planetary gear unit
0° / 90° / 180° / 270°	= Mounting position of primary bevel gear unit
A / B	= Position of the mounting flange at the primary bevel gear unit



10 Address List

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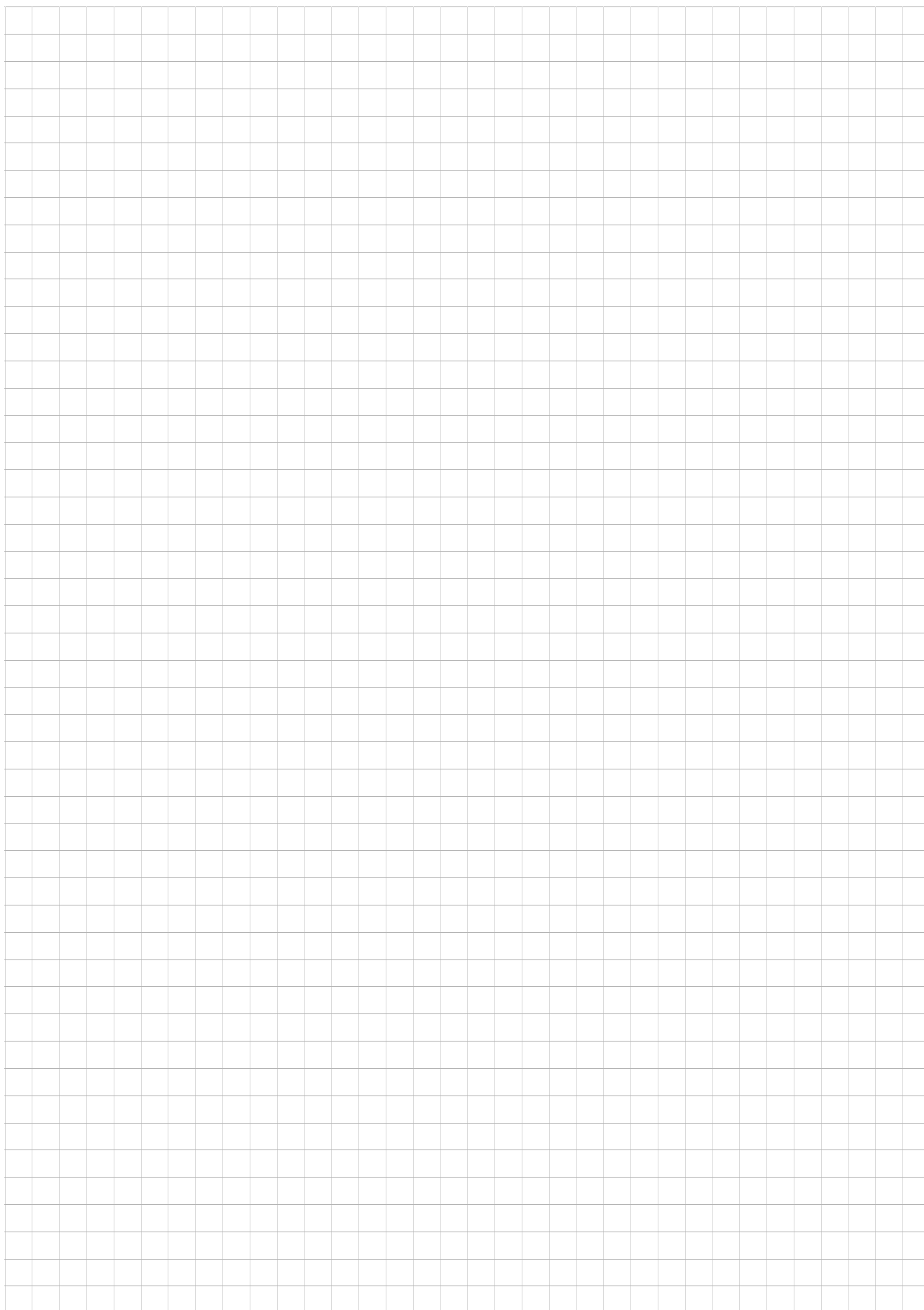
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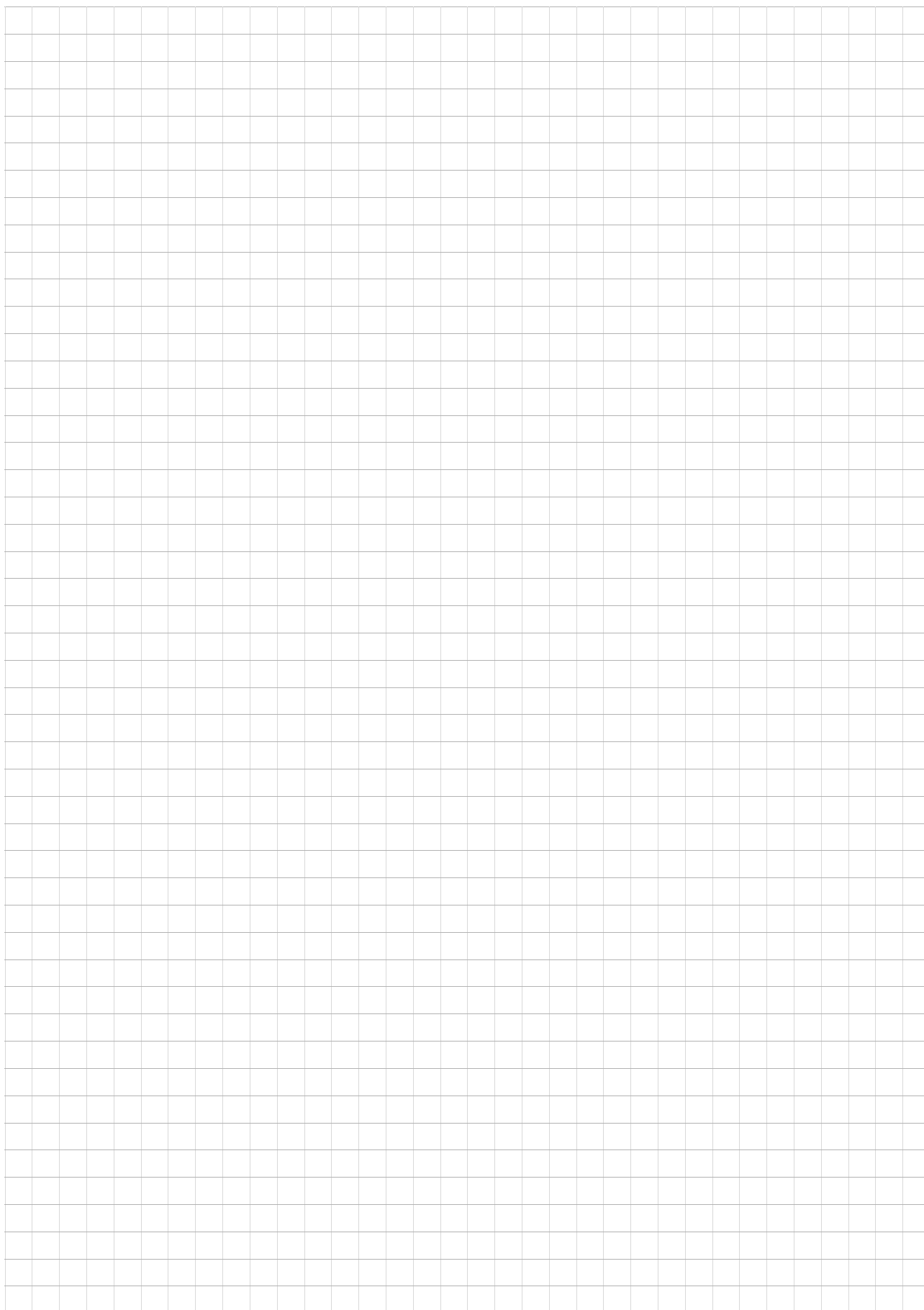
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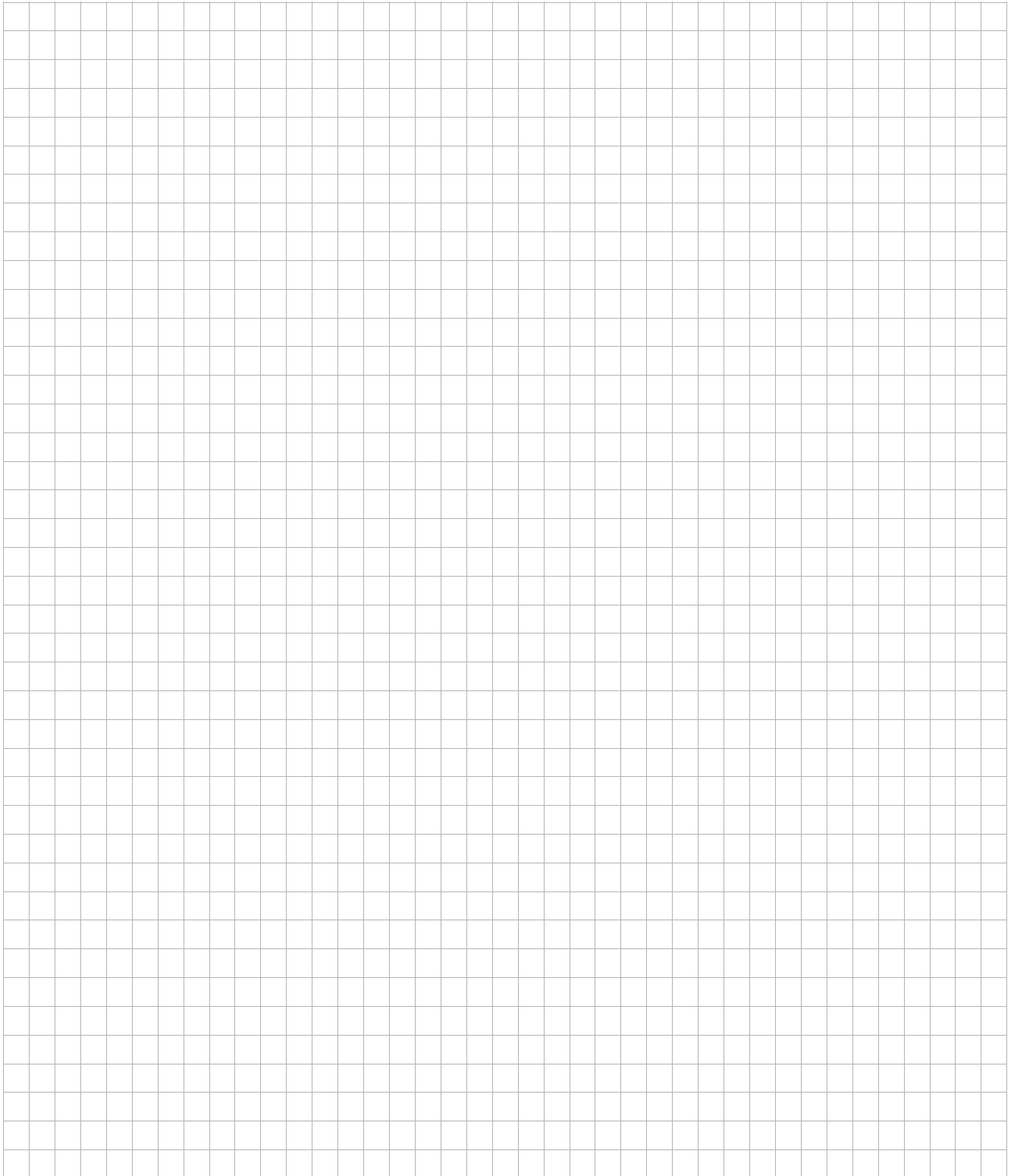


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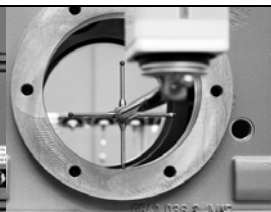
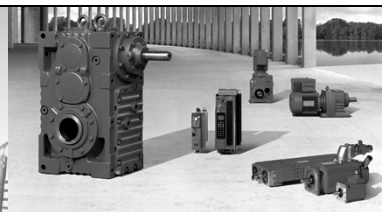
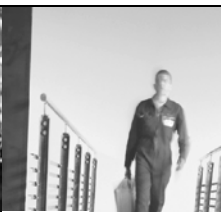
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